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The Journal of the International College of Surgeons

Special Issue

In honor of Dr. Max Thorek

Herbert Acuff, M.D., F.A.C.S., F.I.C.S.
Guest Editor

Vol. XIII *May, 1950* No. 5

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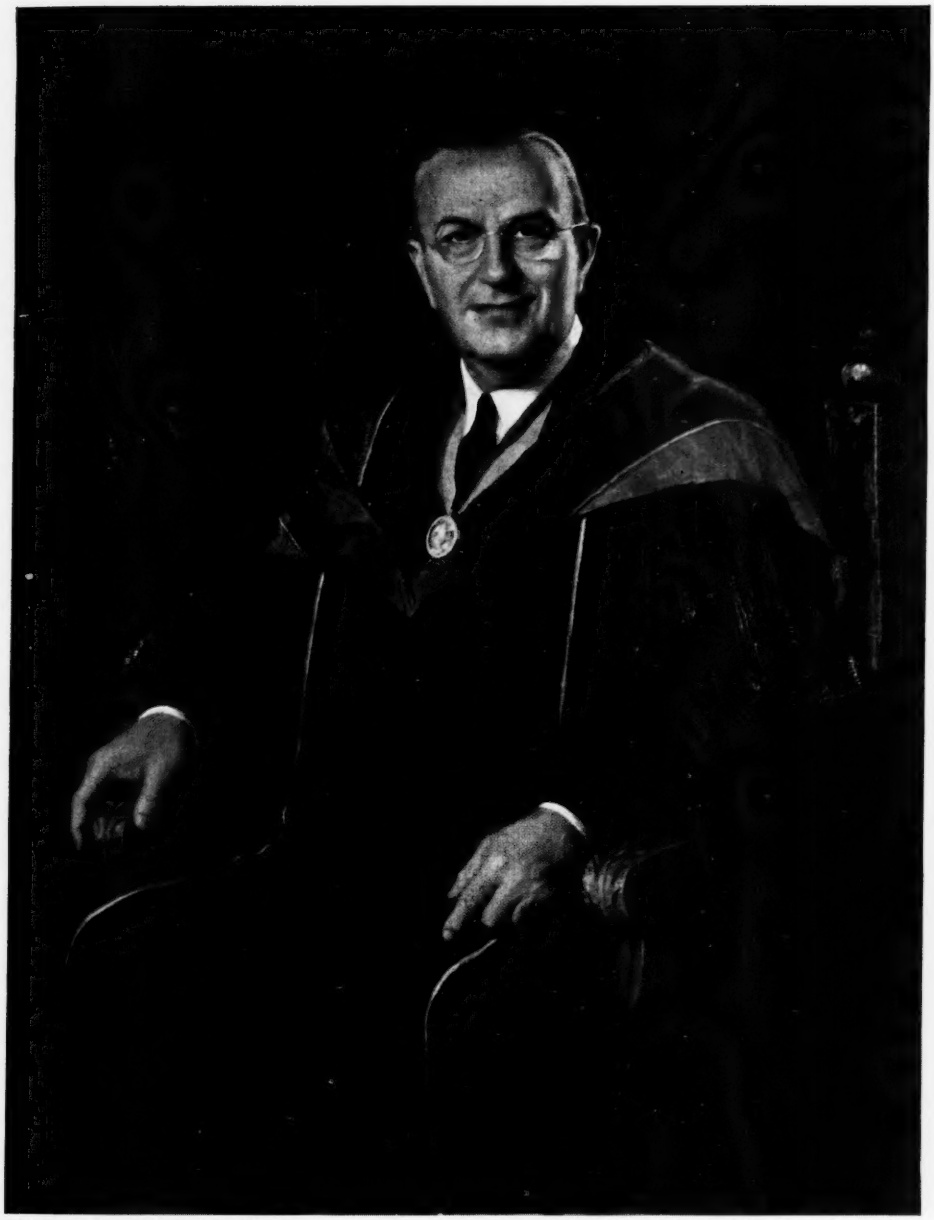

FROM THE PAINTING BY JOHN DOCTOROFF

COURTESY OF THE INTERNATIONAL COLLEGE OF SURGEONS

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Max Thorek, The Man—An Appreciation

HERBERT ACUFF, M.D., F.A.C.S., F.I.C.S.
KNOXVILLE, TENNESSEE

THE name of Max Thorek is well and favorably known in almost every part of the world and signifies a surgeon, an author, a teacher, and an artist. To those who know him intimately it signifies all this and more: a man whose innate qualities make possible his achievements. Could Max Thorek be divested of any or all of his special abilities, he would still be an outstanding personality, analytical, resourceful, active, capable of clear thinking and accurate evaluation. He is endowed with a heart that beats for his fellowman, that loves with devoted passion his family and friends, and is vigilant to detect those who would betray his trust.

He has an uncanny prevision of the future. Long before the world at large took up the ideal of permanent peace and universal brotherhood, he took a great stride in that direction by founding the International College of Surgeons. He continues his promulgation of the ideal through his activities in behalf of the College and through his editorship of its official journal. He constantly recalls the many, here and abroad, who aided in the formative period of the College and continue to do so now. His appreciation has no bounds.

We therefore dedicate this issue of the *Journal of the International College of Surgeons* to our Founder, Max Thorek, in grateful acknowledgment and in affectionate recognition of his personal qualities. It was my pleasant task to assemble the papers presented, a representative collection that should do him honor. The response to my invitations was overwhelming. Accompanying the articles were letters. I shall quote from only a few.

From Victor M. Roman y Reyes, who is not only a surgeon but President of the Republic of Nicaragua, comes the message: "As Founder of the International College of Surgeons, Thorek deserves all distinction. . . . Never were honors bestowed with greater justice."

From Hans Finsterer of Vienna: "My dear friend Max Thorek's good work as a surgeon, his noteworthy scientific publications, and his signally important work in founding the International College of Surgeons constitute a remarkable record in the career of one man."

Felix Mandl of Vienna states: "Max Thorek has done more to cement friendly relations among surgeons than has any other man of my acquaintance. . . . He is a brilliant teacher, a prodigious worker, and a devout student not only of medicine but of literature and music; his personality wins for him a hearty welcome wherever he goes. . . . I count it a distinct honor to call him my friend."

McNeill Love and Zachary Cope of London sent cordial greetings. Mr. Cope says:

"Max Thorek for years has done wonderful work to promote cordial friendship and cooperation among surgeons of different countries. When I came to Chicago, he held out to me the hand of friendship and made me feel at home. Both by precept and by example, he has undoubtedly strengthened the bond of union among surgeons all over the world. May he live long to continue the good work." And Mr. Love: "I selected the subject for my contribution because twelve years ago, after reading Max Thorek's article on the technique of cholecystectomy, my colleague Hamilton Bailey and I adopted the technique he described and later reported 129 cases without mortality. . . . Not only in this field but in many others Max Thorek has introduced new methods and new ideas. Those of us who attended the Assembly in Rome could not but be impressed by the enthusiasm and desire for exchange of ideas among the hundreds of surgeons who attended. Such meetings must bear fruit in stimulating and expanding the knowledge of all concerned."

P. T. Crymble from Belfast writes: "The international importance of a surgeon is perhaps best seen from a distance. For many years the name Thorek has been familiar to us by reason of his surgical books and publications. Visit the local *Times* library and you will find his autobiography recommended. Our university library displays prominently his *Surgical Errors and Safeguards*, and his original gallbladder technique is a constant source of discussion at our meetings. . . . Meeting him in America, I was impressed by his marvelous grasp of detail."

France too adds her tribute through Mr. A. Plichet of Paris, Editor of *La Presse Medicale*: "In addition to his many fine works on surgery, his autobiography, *A Surgeon's World*, must be of great aid and comfort to struggling medical students during their hardest years. In this book he points out the intimate relation between surgery and psychiatry. . . . It is a pleasure to dedicate to him my researches on a certain form of epilepsy."

Max Thorek's *A Surgeon's World* led J. Bitschai of Alexandria, Egypt, to come to America. He writes: "Thorek has a knack of making friends. He knows well how to kindle enthusiasm and to keep it burning. May our College, his creation, continue to enjoy a long and useful life."

A. Lee McGregor of Johannesburg writes: "From far South Africa I extend a hand of greeting to Max Thorek and, through him, to the many leaders of surgery all over the world who by his great qualities have been knitted into a compact fellowship. The great ambition of Max Thorek's life has been to ease humanity's burden of pain and suffering. There can be nothing but admiration for such a man."

From Helsinki, Finland, comes the message of K. E. Kallio: "I am very happy to make a contribution . . . as an expression of the sincere gratitude and admiration I feel toward Dr. Max Thorek, the dynamic and genial leader of the International College of Surgeons."

From Barcelona, Spain, José Soler-Roig writes: "For years I had admired Dr. Thorek as a surgeon. . . . A few years ago, in Rome, I made his personal acquaintance, and since then he has honored me with his friendship. I have learned much from him . . . particularly the value of friendship and collaboration among members of the profession."

From Italy, R. Paolucci and E. Tosatti write jointly: "Shortness of time . . . prevents us from making an offering worthy of Max Thorek. We hope, however, that he will accept our modest offering with a feeling of kindness equal to the affection, consideration and esteem we hold for him."

The International College of Surgeons was not conceived, nor does it seek now, to replace or alter, in any sense, the many fine surgical organizations that exist on a national level. Rather, its goal is to keep pace with the international trend and to make of its members ambassadors of good will.

It has been my pleasant opportunity to have traveled with Dr. Thorek through many states of North America, in Mexico, in Central America, in South America, in Great Britain, in France, Germany and Austria, in Switzerland and Italy, attending meetings of the College. Everywhere he was cordially received. He is highly respected as a surgeon, an author and a linguist. So long as I live I shall treasure these experiences as among the richest of my life.

Dr. Thorek has an unusual sense of perspective. He thinks while others sleep; he

works while others play. Truly, things do not "just happen" to him; on the contrary, he *makes* them happen. Better still, he has the knack of "making things make themselves," of bringing out the creative impulse in others.

His eyes search for the good in men everywhere. He seeks to span the chasm of misunderstanding between men and organizations on the basis of the Golden Rule. His philosophy of life is progress, reward by effort and sincere altruism.

Among the many who have sent their tributes, André Crotti strikes a ringing note by saying: "I offer my modest contribution to the *Festschrift* honoring my friend and colleague, Max Thorek, of Chicago. May he live long and strong."

I am indebted to Crotti for his designation of this issue of the *Journal* as a *Festschrift*. That is just what it is: a warm, timely and genuine expression of the appreciation of generous-minded men toward contemporary distinction. Dr. Thorek is still in the full force of his career, conducting every day of his life a full calendar of surgical and organizational activities. It is fitting that his altruistic philosophy of life, his achievements, and his dynamic talents be recognized now, for the laborer is worthy of his hire. I can do no better than close my own sincere tribute with Dr. Crotti's words, "May he live long and strong!"

Home of the International College of Surgeons
1516 Lake Shore Drive
Chicago

Max Thorek, the Surgeon

HENRY W. MEYERDING, B.S., M.S., M.D., F.A.C.S., F.I.C.S.
ROCHESTER, MINNESOTA

ENDOWED with a brilliant mind, unflagging energy, superior judgment and initiative and strong humanitarian inclinations, Max Thorek was inevitably destined to become an important figure in surgery. With such endowments, it was inevitable that he should become a leader, as well as a steadfast friend, trusted confidant and valued adviser of his associates. He is a linguist who commands many languages, a world traveler and lecturer, student and teacher, musician and collector of art and, in addition, a noted surgeon.

These attributes, as well as a rare ability to attract and perpetuate friendships throughout the world, combined to make him eminently fitted to found the International College of Surgeons. More than any other man, he advanced the growth and progress of this organization, not only by sacrificing his own time, energy and thought to it, but also by his happy faculty of obtaining and cherishing the powerful support of his associates who could provide practical, productive cooperation. It is therefore fitting and satisfying that his friends and associates should join now in creating a Founder's Issue of the *Journal of the International College of Surgeons* to do him honor.

Max Thorek has become a widely known personage, although he rose from most unpretentious beginnings. Two of his great-grandmothers were obstetricians. His mother was one of the first graduates in obstetrics of the University of Budapest. His father spent his life in the practice of medicine, and his grandfather on the maternal side was Dr. Maurice Kinstler, a physician of Boston, Massachusetts.

Max Thorek himself came to America penniless, at the age of nineteen years, and earned his education by playing the violin. He attended the University of Chicago and Rush Medical College, obtaining the degree of Doctor of Medicine in 1904. As time went on, he became attending surgeon at Cook County Hospital and professor of surgery in the Cook County Graduate School of Medicine, which he helped to found. His courses in surgery attracted surgeons from every state in the Union. In the past his personal courses for limited groups in operative technic, held in the American Hospital of Chicago, which he founded and of which he is chief surgeon, were attended by students from all parts of the world.

Dr. Thorek's extensive contributions to the literature need no special mention, for the *Quarterly Cumulative Index Medicus* reflects this work adequately. It can be said that there is scarcely a field in surgery to which he has not given his perceptive attention. His surgical texts are accepted as authoritative; they are found in scientific libraries throughout the world. His first work was a translation from the German of Krause's *Surgery of the Brain and Spinal Cord*, a three-volume English adaptation. His *Surgical Errors and Safeguards*, now in its fourth edition, has been translated into Spanish and Portuguese. His *Modern Surgical Technic* is recognized as a significant contribution to its particular field. This work, first published in three volumes in 1938, has passed through no less than eleven printings, and a special condensation was prepared for the use of our armed forces during World War II. His *Plastic Surgery of the Breast and Anterior Abdominal Wall* and *The Human Face in Health and Disease* have great professional value. Still another work from his versatile pen is his autobiography, *A Surgeon's World*—in several respects an unusual and exceedingly interesting book.

With so many qualifications for leadership and such a record of achievement, Dr. Thorek has been given scores of honors by his professional associates, not only those of his

*Emeritus member, Section on Orthopedic Surgery, Mayo Clinic.

adopted land, but also those who respect and admire him in many other regions of the world. He is an Officer of the Legion of Honor of France, a Knight of the Order of the Crown of Italy, and a Commander of the Order of Saint Alexander of Bulgaria. He has received the Distinguished Citizen's Medal of the Veterans of Foreign Wars of the United States, the Medal of Honor from the government of Venezuela, the Presidential Medal of Honor from the government of Nicaragua, the Order of the Sun from the government of Peru, and the decoration of the Aztec Eagle from the Republic of Mexico. To these have been added corresponding honors from various other national governments.

Dr. Thorek's broad knowledge of the fundamental branches of medicine, his understanding of surgical technic and his diagnostic acumen attract to his operating theater many surgeons from far-distant lands, as well as many in the United States. His unusual ability to operate and to lecture before critical audiences has brought him both admiration and genuine esteem. His contributions to the advancement of surgery in the form of conferences, lectures and the writing of papers and books in various languages have been important parts of his impressive success.

He has always advocated the development of a united, friendly, cooperative medical profession, absolutely without limitations as to race, creed or color. His personality is highly effective; he is widely experienced and therefore uncommonly well equipped to stimulate friendlier relations among members of the medical profession and the people in general. The broad humanitarian principles which he has always embraced and has been firm in enunciating have been accorded powerful support from many disparate quarters and have met with almost universal approbation.

The world in which Dr. Thorek now lives is profoundly different from the world in which Max Thorek, the poor immigrant boy, grew up. He was brought to the friendly shores of America to escape persecution in his native land. By determination, strenuous efforts and almost incredible fortitude he availed himself of the educational opportunities in his adopted land, eventually attaining such eminence as is but rarely conferred upon those who have the good fortune to have been born in the United States. It is proper to say that today his name is well known and warmly regarded in medical circles of both hemispheres. Not only in his chosen profession but in other fields too numerous to detail here, his indomitable spirit has led to constructive achievement of the first magnitude. First, last and always, *he is a builder.*

Great Moment

. . . He pictured the scalpel. He saw it enter the flesh of the cadaver. It was shiny and clean. He saw the knife after the dissection had gone on a little time. It was foul-looking, corroded, stained, tarnished. . . . It was the cadaveric material.

There was no other answer.

He saw himself dissecting women. They were dead of puerperal fever. He felt his fingers wet with the pus and the fluids of putrefaction. . . .

A new light blinded him. Now also the riddle of the clinics was solved. The First Clinic had a higher death rate than the Second Clinic because in the Second Clinic there were only midwives. And midwives did not do dissections.

Ignatz Philipp Semmelweiss had discovered the cause of puerperal fever. . . . To end puerperal fever one simply washed one's hands. . . . A gray horror swept him. He trembled, thinking of the women he had killed. No more must die. There was no time to lose. First, he said to himself, I must be honest. He dipped his quill into the inkpot and began to write. . . .

—Morton Thompson: *The Cry and the Covenant* (Doubleday, 1949)

Scientific Articles

Mediastinal Cyst
Report of Twelve Cases

PROF. DR. R. PAOLUCCI, F.I.C.S. (HON.), AND E. TOSATTI, M.D.
ROME

ALTHOUGH in recent years the general conception of the genesis of mediastinal tumors has been greatly clarified, a satisfying classification of these tumors has not yet been offered. Some have discussed mediastinal cysts together with cystic or pseudocystic neoplasm; others exclude the cystic lymphangioma and nonembryogenic dermoid cysts; still others include intrathoracic goiters, thymic cysts and other cysts caused by degeneration of a neurinoma; finally, a real distinction between ectodermic and mesodermic cysts is not always observed.

The subject, in our opinion, may become clearer if a real distinction is made between congenital and acquired cysts of the mediastinum, excluding from the latter all cysts of the degenerative type (cysts of the thymus, thyroid, etc.) and of the neoplastic type (cystic tumor) and classifying the congenital cysts (according to Carlson, Happly, Hewer and particularly Biocca) as follows:

Congenital Cysts.—Cysts of exclusively ectodermic source are exceptional. In the anterior mediastinum, dermoid cysts of ectodermal and mesodermal origin are relatively frequent; at the time of writing, 250 cases have been described. Only exceptionally have these cysts occurred in the posterior mediastinal area.

Probably these congenital cysts are caused by bronchial organisms dragged into the thorax at the moment of the descent of the diaphragm and the heart (they may even come from the thymus). They have been distinguished by Duval and later by Hewer as follows: (1) laterothoracic, when in addition to the mediastinum they affect one of the hemithoraxes; (2) retrosternal, when they do not exceed the limit of the mediastinum; (3) cervical retrosternal, when they are situated at the base of the neck; and (4) mediastinothoracic, when in addition to the mediastinum they invade both hemithoraxes. These cysts are most often observed in young patients (15 to 30 years of age); they are generally oval and at times lobulated; their volume has been compared to that of a large lemon; their walls are generally formed by thickening of three more or less distinct layers. Elements of epidermis, of derma and of subcutaneous tissue, including cutaneous adnexae, fat and various other substances, are contained in their walls. Although often suppurating, adherent to the surrounding organs, necrotic, easily bleeding and sometimes subject to malignant metaplasia, they are not uncommonly asymptomatic.

The presence of the cyst in the mediastinum may be revealed accidentally by roentgen examination after a trauma or an intercurrent disease; less often, by a special kind of sputum (containing, for instance, hair) and rarely by a typical mediastinal syndrome. Roentgen examination shows a round, nonpulsatile shadow with distinct limits (sometimes identified by calcified walls), frequently close to the hilium or the heart and quite commonly containing bony fragments or part of a tooth.

Cystic lymphangioma of the mediastinum, according to our experience, is much rarer than dermoid cyst. It is not a tumor but a congenital malformation of the lymphatic system. It occurs most frequently in the anterior part of the mediastinum; sometimes it

From the Surgical Clinic of the University of Rome, Prof. Dr. R. Paolucci di Valmaggiore, Director.

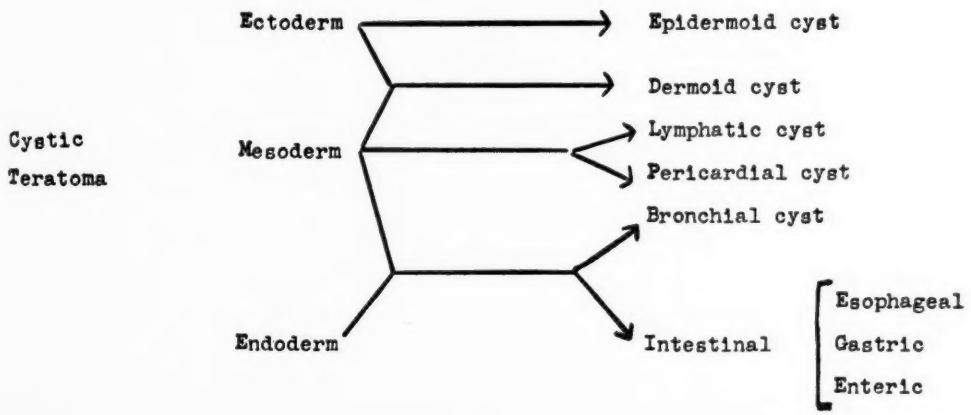
is primitive, and sometimes it represents a lengthening of hygroma of the neck. A thin wall covered with endothelium and a colorless (rarely xanthochromatic) substance are the normal constituents of the lymphatic cyst. Goetsch observed also, in the walls of such cysts, fat, vessels and nerves. In rare cases the lymphatic cyst is unilocular; more frequently, many cysts of various shape and volume are conglomerated and intercommunicating. Generally the cyst is asymptomatic. One case only has been reported in which the lymphatic cyst had given a frank mediastinal syndrome. On roentgen examination a light lobulated shadow of noticeable volume was perceptible. Differentiation of this lesion from other mediastinal cysts, from tumors of the thymus or from duplication of the esophagus is difficult unless one can inject a contrast substance into the cyst.

Mediastinal cyst of the pericardium implies, by its name, a clear topographic indication and a clear indication of its origin. The definitions in common use are not, in our opinion, sufficiently exact. Mediastinal cyst of the pericardium is of mere mesodermic origin; it can be clearly distinguished from the cystic lymphangioma and pericardial diverticulum. Its anatomic picture is quite clear. Its wall is thin and transparent, made up of connective tissue poor in elastic fibers. The wall's interior is covered with a carpet of flat endothelium. Very little proteid content and no mucin is present. The cyst is easily separable from near the surrounding tissues, and this is a feature that distinguishes it from cystic lymphangioma.

Cysts of ectodermal and mesodermal origin (bronchial and intestinal) occur chiefly in the anterior mediastinum; they may reach conspicuous size and invade both hemithoraxes. Generally formed by a very thin connective wall lined with one or more layers of epithelium (ciliated in the bronchial cysts), their content is liquid, usually mucous, gluey, rarely limpid and often yellowish. They generally originate from anomalies in separation of the laryngotracheal channel, though sometimes from small diverticula of the trachea, the bronchi or the esophagus. More often they have been observed near the bifurcation of the trachea; they may have a more or less manifest communication with the bronchial tree. In a case described by Heur the cyst was responsible for a serious mediastinal syndrome. Often they remain completely asymptomatic and represent an accidental discovery at roentgen examination or at autopsy.

Acquired Cyst.—Leaving aside, as has been suggested, the degenerative and neoplastic cysts, we shall now consider the acquired cyst, especially the parasitic type (echinococcus cyst).

The echinococcus cyst may be solitary or multiple, spherical or shaped like an hourglass. Its volume is variable and sometimes enormous. It suppurates easily and is easily perforated, and calcification of its wall is not infrequent. Nevertheless, it is often asympto-



matic; laboratory tests (Cassoni, Ghedini, Weinberg) may give negative results, and eosinophils may be absent. Bronchoscopic, bronchographic and mediastinographic studies afford no help in differential diagnosis. It follows that the echinococcus cyst cannot always be diagnosed preoperatively with assurance, and particularly difficult is its distinction from dermoid cyst. It may be of interest to remember that quite often this type of cyst, being in the proximity of the large vessels of the mediastinum, has been mistaken for aneurysm. Recently Kreuzer pointed out that echinococcus cysts, by compression on the pulmonary artery, have simulated the clinical picture of congenital stenosis of this vessel.

SURGICAL TECHNIC AND RESULTS

Since modern surgical technic permits one to create with ease and impunity a large opening of the pleural cavity, the old systems of aspiration, marsupialization, partial resection, etc., have been completely discarded, and total exeresis of the cyst in one stage has become the normal technic in the majority of cases. The jugular approach is limited to certain cysts located in the anterior mediastinum, and the paravertebral approach is only exceptionally followed.

Dermoid Cyst.—Two hundred and fifty cases are described in the literature, of which 150 have been carefully studied by Heuer (Bastianelli, Bauer, Budde, Crosby, Divis, Aurousseau, Dunkel, Eiselberg, Fanano, Francini, Gallavardin, Gianotti, Heuer, Slaviero, Sussi, Salsano, etc.) The respective statistics are eloquent; best results were obtained by total removal of the cysts:

Drainage: Mortality, 26.5%; recovery, 15%.

Partial resection: Mortality, 16.6%; recovery, 41%.

Total removal: Mortality, 10.8%; recovery, 89.3%.

If to the 76 cases collected by Heuer we add the 14 recent cases of Blades and his coworkers and our own 4 cases (in which all the patients recovered) the mortality rate goes down to 8.5 per cent and the recovery rate up to 91 per cent.

Cysts of Mesodermal and Endodermal Origin.—No more than 60 cases of these types of cyst are described in the literature, and all the patients underwent surgical treatment (Blades 23, Christian 12, Heuer and his coworkers 4, Sauerbruch 2, Ceccarelli 1, Fletcher 1, etc.). Here we may repeat what we have said about dermoid cyst, that the best results are obtained by total removal. Mediastinal cysts have been operated upon by the transpleural approach. Cysts of the cervicomediastinal variety have been treated by the same technic used for retrosternal goiter. Cases of this kind of cyst are certainly not frequent. "Easy" cases, in which a plane of cleavage has been found, have been described. Very difficult situations, in which the tumor joined in a single mass the esophagus, the trachea, and the phrenic and vagus nerves, resulting in a real tribulation for the surgeon, have also been reported.

Mediastinal Echinococcus Cysts.—Only 25 cases are referred to in the literature (Hare, Hoffman, Christian, Rose, Tosatti and Possi, Zilocchi, Paletto). We add now 7 cases in which we operated in a period of three years. All of the patients recovered perfectly. Three of the cysts occurred in the anterior and 4 in the posterior mediastinum. (Heuer reported 7 cases of hourglass echinococcus cyst of the mediastinum. In only 2 cases was operation performed, and in only 1 was a successful result obtained).

REPORT OF CASES

CASE 1. (*dermoid cyst*).—B. G. of Ferrara, a workman aged 33, had begun coughing six months previously, with a temperature ranging up to 38.5 C. and as much as 150 cc. of sputum a day. There was pain on the right dorsal aspect of the thorax, between the median and the posterior axillary line, over the third and fourth rib. Hypophonesis and vocal fremitus were increased, and some small rales were heard in the painful region. Roentgen examination showed a spherical mass in the upper half of the pulmonary field (Fig. 1, left). It was uniformly opaque and about the size of a large lemon, bearing in a large curve on the trachea.

Operation.—Anterior thoractomy was performed. The third and fourth ribs were resected between the parasternal and the posterior axillary line. The cyst having been identified and emptied by suction, it was observed that the posterior wall was fixed by some extremely tenacious inflammatory adhesions. The cyst was therefore removed, only its small adherent posterior portion being

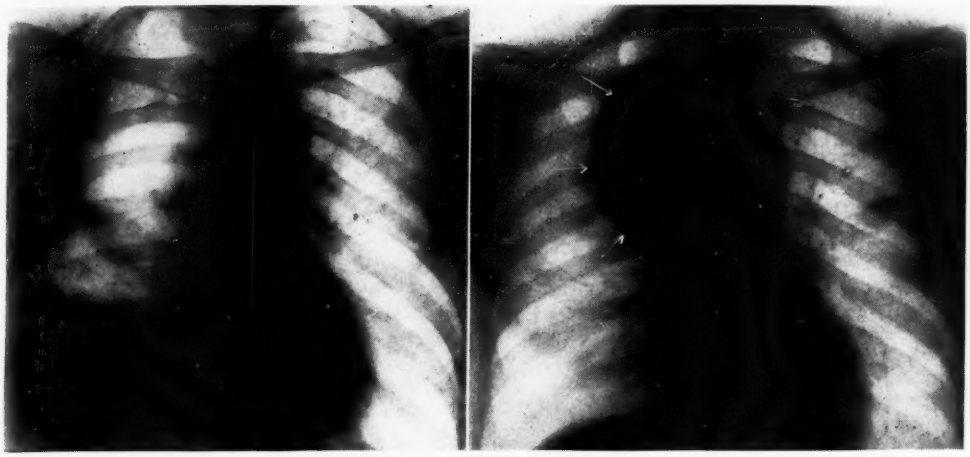


Fig. 1 *(Case 1).*—Dermoid cyst of the anterior mediastinum. *Left,* before operation; *right,* after operation.

left. The contents were frankly purulent. The fibrous wall of the cyst was decidedly thick.

Microscopic Examination.—The wall of the cyst was made up of connective tissue and lined with squamous epithelial cells. Deep in the wall of the cyst were sebaceous glands, hair follicles, sweat glands and nests of leukocytes.

The histologic diagnosis was dermoid suppurating cyst.

Course.—The postoperative course was uneventful, although cleansing and the closing of the residual cavity took some time (Fig. 1, right). Finally a complete recovery was achieved.

CASE 2 (*dermoid cyst*).—B. G. of Cracovia (Poland), aged 36, had suffered from a harassing cough for two years. One month before examination there had been fever, with mucopurulent sputum; one week prior to examination the patient had ejected with her sputum a tuft of hair. Hypophonesis and vocal fremitus were diminished; rales could be auscultated all over the left hemithorax (Fig. 2, left). Roentgen examination revealed a spherical shadow the size of a big orange, with its limits not well defined, joining medially with the anterior mediastinum. The preoperative diagnosis was dermoid cyst of the anterior mediastinum, suppurating and perforating into a bronchus.

Operation.—The fourth rib of the left hemithorax was removed between the parasternal and the posterior axillary line. The pleural cavity was opened wide. The left lung was anteriorly and laterally adherent to the thoracic wall and medially to the mediastinum. The latter was occupied by an elastic mass. Puncture of the mass yielded a few drops of purulent liquid. Subtotal excision of the sac (the wall of which was thick and hard) showed it to contain some tenaciously entangled hair mixed with sebaceous and purulent liquid. The residual cavity was drained. Microscopic examination showed that the wall of the cyst was formed by very thick connective tissue and lined with a layer of cutaneous squamous epithelium. Deep in the wall of the cyst all the cutaneous adnexae were noticeable.

Course.—Convalescence was uneventful. Two months after the operation the drainage was removed. Complete recovery was achieved (Fig. 2, right).

CASE 3.—M. G. of Rome, aged 36 and apparently in perfect health, was submitted to a routine medical examination before entering upon a governmental career. Roentgen examination showed in the left hilomediastinal zone (Fig. 3, left and center) a round shadow the size of a tennis ball, of uniform density and sharply limited. Clinical examination gave absolutely negative results.

Operation.—A parasternal incision was made from the second rib down to the fourth rib in the left side. A 3 cm. segment was removed from the second and the third rib. The pleural cavity was opened, and a round, pulsating bulk was observed in the anterior mediastinum. Detachment of the upper part of the mass was particularly difficult, but the cyst was completely removed. Macroscopic and microscopic observations resembled those in Cases 1 and 2 except that there was no suppuration.

Course.—The postoperative course was stormy for five days and uneventful thereafter. Fever had disappeared by the twentieth day. Two months

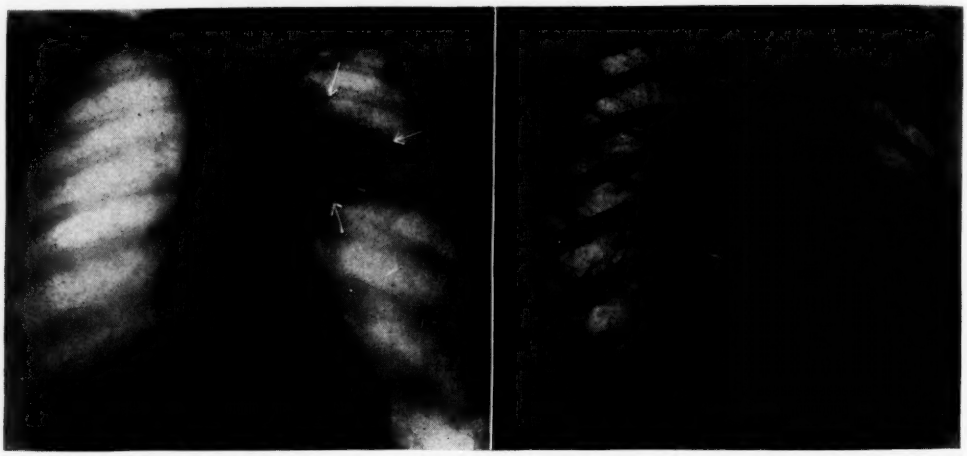


Fig. 2 *(Case 2).*—Dermoid cyst of the anterior mediastinum. *Left,* before operation; *right,* after operation.

after the operation the patient left the hospital entirely well (Fig. 3, right).

CASE 4.—G. G. of Cremona, a teacher aged 66, had noticed eight months previously a pain between the fourth and fifth ribs on the right axillary line. Two months later there were hematic sputum and dyspnea. Hippocratic fingers were noted. Pressure on the fourth, fifth and sixth ribs between the anterior and the posterior axillary line on the right was painful. Hypophonesis and vocal fremitus were increased; there were rales in the interscapular and paravertebral zones between the fourth and eighth ribs. Roentgen examination (Fig. 4, left and center) showed a clearly defined shadow in the upper third of the right anterior pulmonary field. The bulk was delimited inferiorly from an area of interlobar pleurisy. The second and third ribs on the right side were decalcified. The roentgen diagnosis was possible tumor of the mediastinal pleura.

Operation.—An incision was made along the third intercostal space, between the parasternal and the median axillary line. Through the large opening of the pleura a large mediastinal tumor was removed, together with large segments of the second, third and fourth ribs. The tumor was of unequal consistency. It was round, measuring 13 cm. in diameter. It contained a large suppurating cavity. Microscopic examination revealed a squamous cell carcinoma implanted in a dermoid cyst.

Course.—The patient was feverless on the fourteenth postoperative day and left the hospital after twenty-two days. A year and a half after the operation she was in good health (Fig. 4, right).

CASE 5 (*ectodermal cyst*).—B. M. of Bologna, aged 54, had suffered for many years from a harassing incurable cough. Blowing rales were heard all over the pulmonary field. Roentgen examination (Fig. 5, left and center) showed a large cystic shadow at the base of the right hemithorax, with a visible hydroaeric level. It extended medially into the posterior mediastinum and downward into the diaphragm and was neatly delimited by an opaque rim. Bronchographic study showed that the bronchioles were divaricated and encircled the cyst.

Operation.—Posterior thoracotomy was performed, with resection of the posterior tract of the fourth to the seventh ribs. Adhesive pleurisy was present. In the posterior mediastinum a large cavity was seen, containing mucous fluid. On thoracoscopic examination the wall of the cyst was seen to be smooth and vascular; there was no recognizable evidence of connection with the bronchial tree. A pleural pouch was suspected; after a week a phrenicoexeresis was effected, and after fifteen days a thoracoplastic operation was performed. At this operation the correct diagnosis was made and the whole wall of the cyst was removed. It consisted of two layers: an external membrane with connective tissue and numerous vessels, and an internal one made up of cylindric stratified epithelium with ciliated cells (definitive diagnosis, posterior mediastinal cyst of ectodermal origin). After the last operation the patient recovered completely. Gauze packing soaked with opaque substance shows the zone in which the cyst was located (Fig. 5, right).

CASE 6 (*parasitic cyst*).—L. N. of Rome, aged 27, complained of slight pain at base of the right hemithorax and frequent "sobbing" of two months' duration. One month prior to examination coughing had begun, with mucous and sometimes rusty sputum. Blowing rales were present all over the pulmonary field. The Cassoni reaction was positive. The blood count showed 2 per cent eosinophils. Roentgen examination showed a round homogenous area of opacity, clearly delimited in the anterior mediastinum, jutting out into the right pulmonary field at the level of the hilum.

Operation.—An incision was made between the parasternal and the posterior axillary line, in the seventh intercostal space. Tenacious interlobar adhesions extended to the pericardium and the mediastinum. The cyst had originated in the high anterior part of the mediastinum. Numerous adhesions between the mediastinal pleura and the lung were eliminated; this was followed by puncture of the cystic wall and by suction. The cystic membrane was completely removed. A small drain was placed in the pleural cavity. This was followed by suture of the thoracic wall.

Course.—The drain was removed after forty-eight hours. The patient was free of fever on the sixth day and is recovering.

CASE 7 (*parasitic cyst*).—D. G. G. of Eboli, aged 43, complained of coughing of two months' duration, with abundant expectoration, and a temperature up to 39 C. There was hypophonesis; vocal fremitus was diminished; small rales were heard in the apical zone of the left lung. The Cassoni reaction was negative. Roentgen examination showed a sharply limited spherical opaque area the size of a tennis ball in the anterior mediastinum, jutting out into the superior third of the left pulmonary field.

Operation.—An incision was made, following the third intercostal space. The parietal pleura was opened; an incision was then made in the mediastinal pleura. A spherical bulk the size of a tangerine, with a fluid content, was disclosed. Puncture of the mass yielded rocky water. The cystic wall was taken away by suction. The mediastinal pleura was sutured and the lung reexpanded. The diagnosis was echinococcus cyst of the anterior mediastinum.

Course.—The postoperative course was uneventful. The patient left the hospital fifteen days after the operation, fully recovered.

CASE 8.—B. G. of Rome, a worker aged 38, had had chronic bronchitis for several years. After a roentgen examination he was referred to our clinic. The subclavicular left zone jutted out more than did the opposite side. Vocal fremitus was abolished. There were local apnea and dullness. Posteriorly, at the same level, the clinical picture was exactly the same. On the right side there was hypophonesis between the fifth and the eighth rib. Blowing rales were noted all over the pulmonary field. Roentgen examination showed two large masses of homogeneous opacity coming from the mediastinum and extending to the thorax on both sides (Fig. 6, upper left and right). The one on the left was as large as the head of a newborn baby. The esophagus was displaced backward and showed strangulation at the level of the fifth and sixth thoracic ribs. The Cassoni reaction was positive. The leukocyte count showed 5 per cent eosinophils.

Operation.—A wide opening was made on the right parasternal line at the level of the second to the fourth rib. An elastic mass soon appeared. A small opening on the mass gave way to some small daughter cysts. The breach was enlarged,

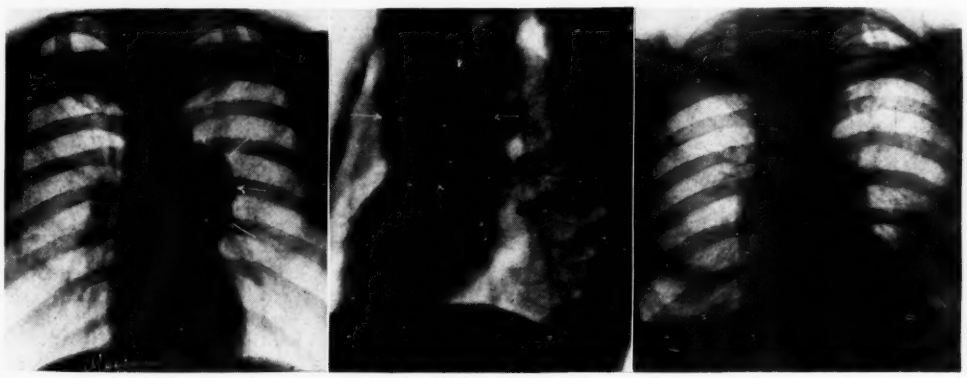


Fig. 3 *(Case 3).*—Dermoid cyst of the anterior mediastinum. *Left*, before operation; *center*, preoperative lateral view; *right*, after operation.

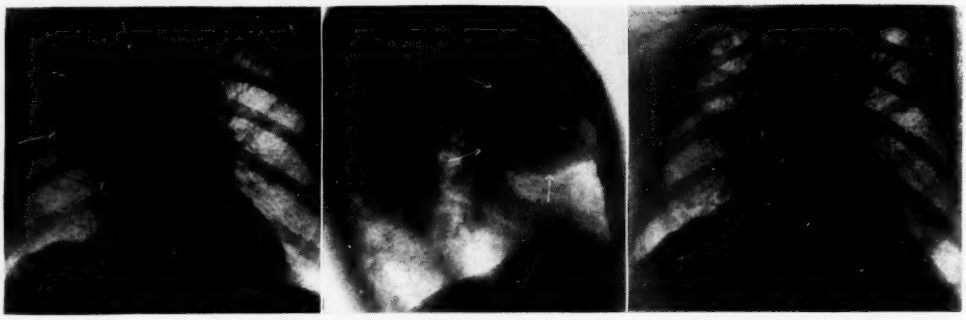


Fig. 4 *(Case 4).*—Dermoid cyst of the anterior mediastinum with malignant metaplasia. *Left,* before operation; *center,* preoperative lateral view; *right,* after operation.

and 100 small cysts emerged; more cysts could be extracted by introducing the whole hand into the cavity. The two large cavities were intercommunicating. The diagnosis was enormous bilocular hourglass echinococcus cyst of the anterior mediastinum.

Course.—There was serofibrinous pleurisy (Fig. 6, lower left) after the operation. The patient recovered, leaving the hospital thirty days later (Fig. 6, lower right).

CASE 9 (*parasitic cyst*).—C. G. of Rome, aged 50, had suffered for more than a month with a harassing cough, with scanty mucous sputum and dyspnea which disappeared completely as soon as the patient lay down in bed. The veins of the neck were dilated; a venous reticulum was evident on the thoracic wall from the supraclavicular zone down to the sixth intercostal space; blowing rales were noted in the superior right thoracic field. The Cassoni and Ghedini reactions were positive; the leukocyte count showed 12 per cent eosinophils. Roentgen examination of the anterior mediastinum showed a large shadow of the size and the shape of a tennis ball, jutting out in the superior part of the right pulmonary field. The mass displaced the aortic arch downward and outward.

Operation.—An anterior incision was made, following the second intercostal space on the right side, between the parasternal and the anterior axillary line. As soon as the pleura was opened a huge nonpulsatile mass appeared in the anterior mediastinum. Its size was that of a hen's egg. An incision of the mediastinal pleura was made. Puncture of the mass, followed by suction, permitted complete removal of the cyst. The diagnosis was echinococcus cyst of the anterior mediastinum.

Course.—Recovery was uneventful. The patient left the hospital on the fifteenth day, recovered.

CASE 10 (*parasitic cyst*).—T. G. of Teramo, aged 26, had been in apparent good health until twenty days before examination, when there occurred vomiting of a material in which the family physician recognized some daughter cysts. Blowing rales were detected all over the whole right thoracic field. The Cassoni and Ghedini reactions were positive; eosinophils, 2 per cent. Roentgen examination showed two spherical shadows in the inferior part of the right thoracic field. A third, supradiaphragmatic shadow appeared close to the heart. In a lateral projection this shadow seemed to be located in the posterior mediastinum.

Operation.—An anterior incision was made, following the sixth intercostal space between the parasternal and the median axillary line. Through the opening of the pleura in the posterior part of the inferior mediastinum appeared a mass the size of a large hen's egg. Puncture and suction of the cyst were carried out. Removal of the pulmonary cysts was deferred owing to a derangement in the anesthetic apparatus. The diagnosis was echinococcus cyst of the posterior mediastinum and of the right lung.

Course.—Convalescence was uneventful. (One month after the operation the patient suddenly died of an enormous flooding of the bronchial tree.)

CASE 11 (*parasitic cyst*).—S. S. of Rome, aged 23, underwent a roentgen examination a year and a half before examination here. Two cystic bulks were discovered, one in the right lung and the other in the anterior mediastinum. There had been a harassing cough for two years, with scant expectoration; sometimes a little blood was mixed with the sputum. For one year the patient had had occasional light pains in the right hemithorax. There were no important clinical signs or symptoms. The Cassoni reaction was positive, the Ghedini negative. The leukocyte count showed 2 per cent eosinophils.

Operation.—An incision was made following the third intercostal space. Through the opening of the mediastinal pleura the cyst was easily isolated and removed by means of puncture and suction. Drainage was instituted.

Course.—Convalescence was uneventful. The patient recovered and left the hospital twenty-five days after the operation.

CASE 12 (*parasitic cyst*).—R. S. of Trani, aged 67, had felt one year previously an acute pain in the left hemithorax during inspiration. Six months later there was fever, with coughing and abundant expectoration, but the temperature did not rise above 38 C. Hypophonesis and a few rales were noted at the base of the left hemothorax. The Cassoni and Ghendini reactions were negative. The leukocyte count showed 5 per cent eosinophils. Roentgen examination revealed a paravertebral spherical shadow as large as a big hen's egg at the base of the left hemithorax. The mass rested on the diaphragm; on its medial side it extended into the mediastinum.

Operation.—A posterior thoracotomy was performed between the paravertebral line, following the ninth intercostal space. The tenth and eleventh ribs were removed. A large cyst was observed in the posterior mediastinum. The pericystic membrane was joined to the pleura. The cyst was punctured, emptied and removed by suction. The pleural cavity was drained. The diagnosis was echinococcus cyst of the posterior mediastinum.

Course.—Recovery was uneventful. There was no fever after the tenth day. The patient left the hospital twenty days after the operation.

COMMENT

Of 12 mediastinal cysts surgically treated and studied by us, 4 were dermoid cysts (1 in malignant metaplasia), 1 was an ectodermal cyst and 7 were echinococcus cysts. All 4 of the dermoid cysts were in the anterior mediastinum and of the laterothoracic type (Duval). The ciliated cyst was located in the posterior mediastinum. Of the 7 echinococcus cysts, 4 were located in the anterior and 3 in the posterior mediastinum. The localization in the anterior or the posterior mediastinum has been ascertained on the basis of stratographic as well as operative observations. The largest size was observed in 1 case of echinococcus cyst of the anterior mediastinum; in this case the cyst extended into both hemithoraxes. In the whole group of mediastinal cysts described, no very important mediastinal syndrome was noted. In 2 cases only (1 of echinococcus cyst and 1 of dermoid cyst) was there a complete absence of symptoms. In only 1 case of dermoid cyst was there a really characteristic symptom: hair in the sputum. In 2 cases there were clinical signs of suppuration. Three patients complained of pains of varying intensity and extent (notably the patient with the malignant metaplasia). Of the 7 cases of echinococcus cyst a venous collateral reticulum was present in only 1, and in only 1 was there an anatomic modification of the subclavicular region. Dyspnea also appeared in only 1 case. Finally, only 1 patient complained of inspiratory pain and hiccough. Three had fever and various pains. Two had chronic bronchitis. Six had been coughing for a long time, with abundant expectoration (blood in the sputum in 3 instances).

The biologic test of Cassoni gave a positive

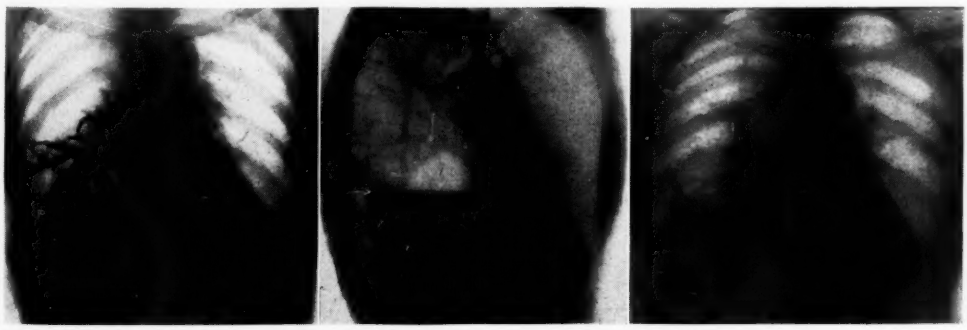


Fig. 5 *(Case 5).*—Ciliated cyst of the posterior mediastinum. *Left,* before operation; *center,* preoperative lateral view; *right,* after operation.

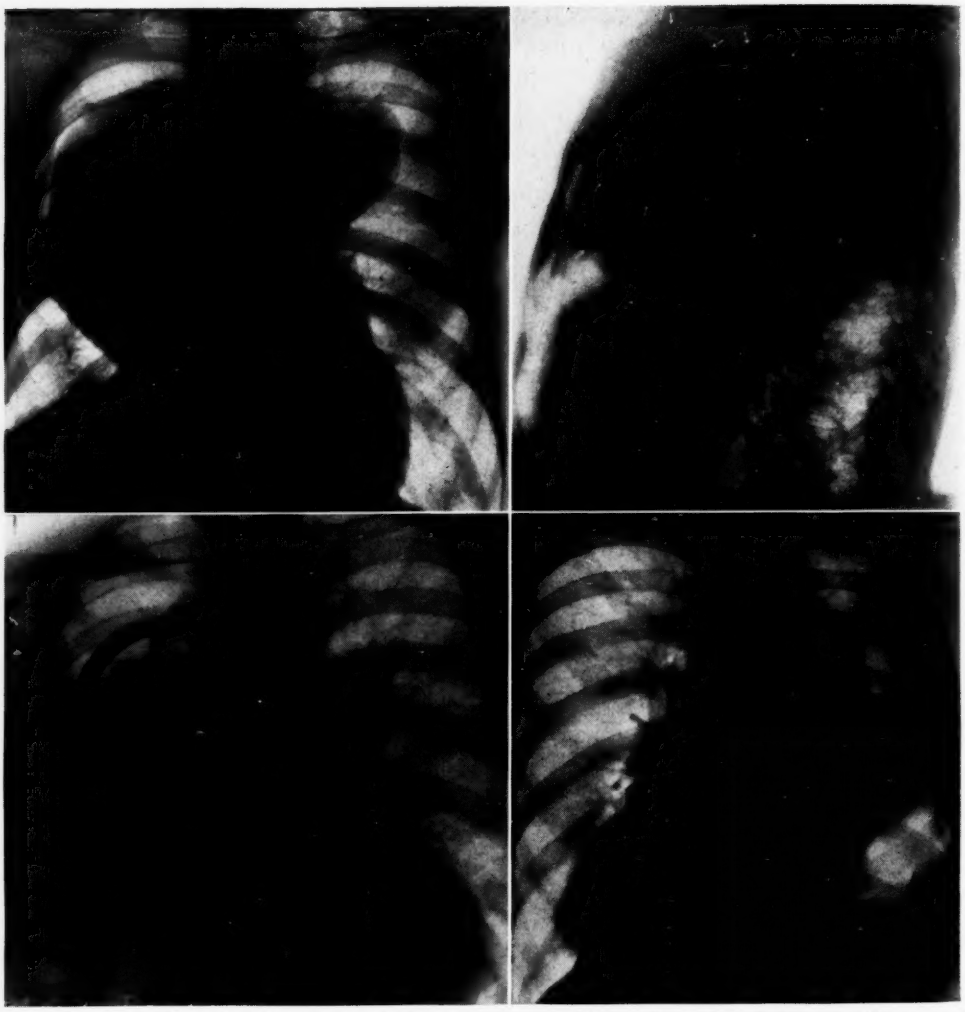


Fig. 6 *(Case 8).*—Gigantic echinococcus cyst of the anterior mediastinum. *Upper left,* before operation; *upper right,* preoperative lateral view; *lower left,* film taken nine days after operation; *lower right,* film taken forty-five days after operation.

result in 5 of the 7 cases; the Ghedini test, in 3. Eosinophilia was evident in 3 cases. The patient with ciliated cyst had been complaining for many years of chronic bronchitis.

Roentgen control made possible the diagnosis in 6 cases, and in only 3 was the diagnosis categorical. The bronchographic picture of the ciliated cyst was very interesting. One echinococcus cyst of the anterior mediastinum reached an enormous volume.

In most cases the patient was prepared for the operation as follows: hyperalimentation (proteins and vitamins), respiratory and gymnastic exercises, and antibiotics. The anesthesia of choice for the last few years has been, generally, intubation with 0.02 per cent pento-

thal and curare. Formerly local anesthesia was employed. Systematic prophylaxis against operative shock before, during and after the operation was carefully maintained.

In the 4 cases of dermoid cyst the operation was performed through the pleural cavity. In the 7 cases of echinococcus cyst it was carried out 6 times through the pleural cavity and only once by the parasternal approach. As regards the case of ectodermal cyst, since the diagnosis was mistaken, the radical paravertebral extrapleural operation was preceded by a phrenicoexeresis and by a thoracoplastic procedure. Dilation of the lung in cases in which operation was performed through the pleura has been practiced generally by means of suction through a drainage tube until the correct negative pressure in the pleura was obtained. As a routine treatment we thought it wise in each case to leave, usually no longer than forty-eight hours, a drainage tube in situ to prevent the dreaded complication of diastinal emphysema, especially when laborious detachment of the pleural sheets had been necessary. In the other cases the drainage tube was left in place and gradually reduced in size while the cavity was progressing toward complete elimination of the dead space. In these same cases, though seldom, the drainage tube was utilized to inject the usual antiseptics and antibiotics into the residual cavity.

SUMMARY

The authors present their study of a series of 12 cases of mediastinal cyst (4 dermoid, 1 ciliated, 7 parasitic) in which they operated successfully.

RÉSUMÉ

Les auteurs étudient une série de 12 kystes médiastinaux (4 dermoïdes, 1 cilié et 7 parasitaires) qu'ils ont opérés avec succès.

RESUMEN

Los autores presentan su estudio de una serie de 12 casos de quiste mediástinico (4 dermoides, 1 ciliado, 7 parasitario) que fueron operados con éxito.

RIASSUNTO

Presentano 12 casi di cisti del mediastino (4 dermoidi, 1 ciliata, 7 parassitarie) operati felicemente.

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If the conquests useful to humanity touch your heart, if you are astounded at the astonishing results of telegraphy, of photography, of anesthesia. and of all the other admirable discoveries. . . . take interest, I beg of you, in those sacred dwellings which have been designated with the expressive name "laboratories." Demand that they multiply and be adorned; they are the temples of the future.—*Pasteur*

My Experience with Total Gastrectomy

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IT HAS been a rule in radical operations for carcinoma to remove the entire diseased organ, e.g., the uterus or the breast, together with the tributary lymphatic system, in order to avoid recurrences both locally and in the lymphatic structures involved. According to my knowledge of the current literature, Lefèvre of Bordeaux is the only surgeon to advocate total gastrectomy even in cases of carcinoma located in the distal part of the stomach. He is fully entitled to call for total gastrectomy, which, in his own experience, has had a mortality rate no higher than that of subtotal gastrectomy. I myself have used, as the method of choice, *subtotal gastrectomy* with a small strip of fundus remaining. Ever since 1910, in the interest of a radical procedure, I have resected the greater omentum in all cases, together with the lymph glands, as well as the lesser omentum right up to the esophagus and the lymph glands adjacent to the celiac axis. Other surgeons have resected the omentum only during the last year or two.

If subtotal gastrectomy is adequately performed, the Billroth II anastomosis as done by Billroth himself is technically impossible. According to his original method the resection wound was completely closed and then a side-to-side anastomosis of the gastric stump with the first jejunal loop either retrocolic or antecolic, was performed. In view of the fact that these were small resections and that the gastric stump was large, the anastomosis was effected away from the closing suture line. In subtotal gastrectomy only a narrow strip of fundus is left and the side-to-side anastomosis is adjacent to the closing suture line of the stomach. The latter invaginates into the mouth of the gastroenterostomy and may cause death from repeated vomiting. I saw this at autopsy in several cases when I was an assistant surgeon at Hochenegg's Clinic. This can be avoided in subtotal gastrectomy only by using an end-to-side anastomosis. Reichel and Polya have used the entire breadth of the gastric stump to form the anastomsis. I close the upper part of the resection wound and perform an anastomosis corresponding to the greater curvature, leaving only a 3-fingerbreadth opening. I performed this operation for the first time on Sept. 18, 1911, at Hochenegg's Clinic. The patient was a 59-year-old woman who had a fist-sized carcinoma of the lesser curvature that extended up to the cardia. The Billroth II method was impracticable in her case because of the small gastric stump. I presented an exhaustive case history of this patient in my paper "Local Anesthesia with Gastric Surgery" (Beiträge zur klin. Chir. **81**:303, 1914). The postoperative course was highly satisfactory, and there was no vomiting. Therefore I have used this method ever since, not only in subtotal resection for carcinoma but in two thirds of all gastrectomies for peptic ulcers. I have records of over 8,000 patients treated by this method.

In cases of carcinoma of the lesser curvature extending into the right wall of the esophagus I have also resected this part of the esophagus in my subtotal gastrectomies. I tried to strengthen the suture line of the right wall of the esophagus, which has no peritoneal covering, with the fundus, which I fixed to it, or with the afferent anastomotic loop. At that time I wished to avoid total gastrectomy because of its high mortality. The results were poor; of 55 patients, 41 (74.5 per cent) died. This high mortality rate prompted me to suggest, in a major publication on carcinoma of the stomach, that total gastrectomy would be preferable in such cases only if it were possible to decrease its mortality.

Total gastrectomy was carried out successfully for the first time by the Swiss surgeon Schlatter in 1897, in the case of a 57-year-old woman who had a carcinoma involving the entire stomach, from the pylorus to the cardia. In the ensuing years, apparently, this operation was rarely performed; there are only a few reports of its success.

*First President, Austrian Chapter, International College of Surgeons, 1948-1950.

From the Surgical Ward of the Allgemeines Krankenhaus, Vienna, Prof. Dr. H. Finsterer, Director.

Forty-two years ago the French surgeon Delagéniére called total gastrectomy the only warranted radical operation. He added, however, that a narrow strip of fundus should be preserved in order to accomplish a reliable anastomosis. This is rather a subtotal than a total gastrectomy. A strip of fundus tissue 5 to 8 cm. long is left *in situ*. Stahnke in 1933 was able to collect 62 cases of total gastrectomy from the current literature, including 3 in which the patients had been successfully operated on by A. W. Meyer. Goto (Japan) in 1933 compiled 140 cases of total gastrectomy from the American and European literature, adding 65 cases from Japan. Only 6 authors—I was one of them, with 20 total gastrectomies—had operated on 14 to 20 patients themselves. During the past ten years total gastrectomy will certainly have increased in number of performances.

Since my first total gastrectomy, which I performed on April 30, 1913, as an assistant at Hochenegg's Clinic, on a 47-year-old man (local anesthesia of the abdominal wall and ether anesthesia were used; the patient died of pneumonia twelve days after the operation) I have done total gastrectomies in 124 cases up to Dec. 31, 1949. I operated in several private hospitals and, since August 1935, in the surgical ward of the Allgemeines Krankenhaus. Sixteen total gastrectomies will be added which were performed by my assistants Bischof, Walterskirchen and Winkler. We therefore have a total series of 140.

Total gastrectomy was performed only after a diagnosis of carcinoma of the stomach. In 4 cases, however, the pathologic picture as observed microscopically did not confirm this diagnosis.

CASE 1.—A 40-year-old officer was operated on Dec. 20, 1916, at Garnisonspital No. 2, with the roentgen diagnosis of carcinoma of the stomach (Holzknecht). A small and shrunken stomach was found on operation, with an apple-sized mass in the fundus. Subtotal gastrectomy was not applicable, and total gastrectomy was therefore performed. Twenty cm. of jejunum had to be resected because its mesentery had shrunk considerably. This enabled me to do an end-to-end anastomosis with the esophagus and prevented tension in the bowels reattached to one another. Histologic diagnosis (done by Professor Paltauf) revealed no carcinoma but a shrunken stomach due to syphilis. Thirty-six hours later the patient died. At postmortem examination Prof. Paltauf observed an enormous dilation of the duodenum due to its compression through the mesentery of the anastomotic loop. Prof. Paltauf was of the opinion that death was caused by shock due to a duodenal reflex mechanism.

CASE 2.—A 52-year-old woman, a doctor's wife, underwent a two-stage operation on June 24, 1935, because of gastric polyposis which had lasted for three years and had produced severe anemia (2,400,000 erythrocytes per cubic millimeter of blood and a hemoglobin value of 30 per cent). In her first operation an ulcerated, broad-necked polyp was seen, which was thought to be carcinoma. The esophagus was pulled down from the mediastinum and attached to the diaphragm. The first loop of the jejunum was pulled through the mesecolon and slid into the upper abdomen, and an enteroanastomosis of the two loops was formed. Two weeks later total gastrectomy was performed after a laparotomy in the area of the left inferior costal margin. An end-to-side anastomosis between the esophagus and the jejunal loop in the upper part of the abdomen was performed. Histologic examination by Prof. Sternberg revealed a large ulcerated polyp of the stomach, without signs of malignancy. The anastomosis healed without fistula formation. However, gangrene of the muscles of the upper wound margin ensued because of inadequate blood supply, and chronic septicemia ended the patient's life four weeks after the operation.

CASE 3.—A 40-year-old woman on whom operation had been performed Oct. 18, 1943, had numerous firm polyps in the pars media and pars cardiaca which were broad-necked in the vicinity of the cardia. I therefore suspected that they were carcinomatous and performed a total gastrectomy. Histologic examination (by Prof. Chiari) revealed polyp formation without malignancy. There was considerable postoperative pyrexia, and death occurred in six days. Autopsy revealed a left subphrenic abscess due to insufficient draining (the rubber drain was too short to reach the abscess). In addition, there was empyema of the left pleural space and splenomogaly caused by septicemia.

CASE 4.—A 54-year-old man had been having gastric trouble for a long time. Four months previously he had undergone an exploratory laparotomy in another hospital, and the diagnosis had been carcinoma of the stomach. The neoplasm extended into the spleen and the esophagus and was declared inoperable. The patient was admitted to my service because of extreme pain. The gastrointestinal roentgen series suggested a mass in the cardial area of the stomach, with questionable encapsulated rup-

ture into the spleen. Esophagoscopic study revealed no abnormalities of the esophagus and no mass in the cardia. On Sept. 20, 1948, I operated. A medium-sized laparotomy was done with the operative region under local anesthesia. Ether anesthesia was used for the adhesiolysis, followed by spinal anesthesia. There was a mass present on the greater curvature which extended to the spleen and to the pancreas. Gastrotomy and digital exploration revealed a deep crater, with a rather firm and nodular floor, extending to the spleen. Ulcerative carcinoma was suspected. Total gastrectomy with splenectomy and resection of the tail of the pancreas was performed. The splenic artery showed an abnormality in that it was imbedded in the pancreas and emerged to the surface only at the cauda. I performed an anastomosis, uniting the esophagus with the jejunum in accordance with Lèfèvre's method. Sulfonamide powder (Marfanil) was used for the left subdiaphragmatic area, and 2 gauze strips were inserted in order to counteract the displacement of loops of the small bowel above the level of the transverse colon. Two rubber tubes were fixed, and a closing abdominal suture line ended the operation. Prof. Chiari (Pathological Institute) reported a large callous peptic ulcer of the greater curvature, with penetration into the spleen. There was also chronic gastritis. No substratum for malignancy was observed in this very large peptic ulcer. A postoperative blood transfusion was followed by a second transfusion on the following day, and the patient also received treatment with penicillin. The postoperative course was remarkable. During the first week the patient's temperature never exceeded 38 C. (100 F.); after that time it remained normal. The anastomosis healed without fistula formation, but there was afebrile suppuration from the left hypochondrial area for some time. Six weeks later the patient was discharged cured. He now lives in the open country and reported on April 5, 1949, that he is free of discomfort and is able to eat anything, including kidney beans, peas and kraut. He also reported a gain in weight of 13.2 pounds (6 Kg.).

In the first of these 4 cases I might have avoided failure of the operation if, in performing the Y-shaped anastomosis, I had connected the efferent jejunal loop, with its short mesentery, to the esophagus behind the afferent rather than before the afferent loop. This might have prevented compression of the afferent loop and, consequently, death due to the duodenal reflex mechanism. In the second case a midline laparotomy should have been preferred to the second operation actually performed. The left rectus muscle should have been severed transversely, which I always do in performing a total gastrectomy. This would have obviated gangrene of the abdominal wall, which was all the more deplorable as the anastomosis healed without fistula formation. In case 3, again death might have been prevented if a rubber drain of sufficient length had been used in conjunction with gauze strip drains.

Case 4 represents my only total gastrectomy for a callous peptic ulcer in a total of 140 total gastrectomies performed. During operation, in some cases, it is not possible to tell the difference between a callous peptic ulcer and a secondary malignant tumor developing in a peptic ulcer. Even gastrotomy and bare finger palpation of the ulcer margins is not conclusive. In case 4 I was convinced of the diagnosis of carcinoma resulting from the first operation, because a peptic ulcer of the greater curvature is extremely rare. Also, the fact that the base of the tumor was rather firm and nodular made me think of an ulcerative carcinoma that had extended to the spleen and to the pancreas. I consequently tried total gastrectomy with splenectomy and resection of part of the pancreas because of the comparative youth of the patient. I was lucky that the patient was cured. However, there is a possibility that secondary anemia will follow total gastrectomy; this is accepted by patients with carcinoma as a minor evil, but it is not warranted when total gastrectomy is performed for a peptic ulcer. Had the correct diagnosis of peptic ulcer been established, I should have performed the Kelling-Madlener procedure, which would have certainly cured even this huge ulcer.

If differential diagnosis between peptic ulcer and carcinoma is doubtful after gastrotomy and digital exploration, I base my decision on the general status of the patient and on the extension of the tumor into adjoining structures (spleen, pancreas, liver). Only if carcinoma is the more likely diagnosis do I consider total gastrectomy indicated, for it still has a high mortality rate in my own experience. If peptic ulcer seems more likely, I perform the Kelling-Madlener operation. The cardial part of the ulcer is left *in situ* and only the distal part of the stomach is resected (according to Billroth I), or else I do a two-thirds gastrectomy by the Hofmeister-Finsterer technic.

The Kelling-Madlener procedure is rarely necessary for peptic ulcers located in the vicinity of the cardia. Of 614 cases of ulcer near the cardia, in which I operated up to Jan. 1, 1949, the ulcer was removed in 535 cases by the curved resection method; in only 79 cases was a Kelling-Madlener technic required. The ulcer healed a short while after this procedure, and the permanent results are therefore good. In a follow-up check in 1945, 33 of 35 patients who had reported had been free of symptoms for three to ten years. Madlener himself had similar satisfactory results. Of his 29 patients, 27 were completely asymptomatic for three to sixteen years, and so were 2 additional patients after one year.

In 4 Kelling-Madlener operations I was unable to decide diagnostically between a simple peptic ulcer and an ulcer-carcinoma, but I discarded total gastrectomy because of the patients' age and poor general condition. I did the resection according to Kelling-Madlener rather than declare them inoperable. Two of these 4 patients died of carcinoma, whereas the 2 others, who had peptic ulcers only, have been completely asymptomatic for the past ten years. Had I tried total gastrectomy on these patients, in whom the peptic ulcer extended into the pancreas, they would probably have succumbed just as did the 2 others with carcinoma, since their general health was poor.

Total gastrectomy will still be performed in some cases in which peptic ulcer is believed to be carcinoma. However, I think it unwarranted when the diagnosis of peptic ulcer is made beforehand, even if the ulcer extends into the cardia. Total gastrectomy was advocated even under these conditions by Gissel in 1937, in a report on 26 such operations performed at the Rostock Clinic, Germany. In his series there were 4 peptic ulcers, 2 of which were operated on as carcinomas and 2 others which were known to be peptic ulcers; total gastrectomy was done in all 4 cases because a normal resection was not feasible owing to a shortening of the lesser curvature. In my own experience these ulcers of the lesser curvature, even if they extend up to the cardia, can be removed radically and successfully with the curved resection technic and a Hofmeister-Finsterer anastomosis. I have proved this in 535 patients who had the benefit of this technic.

Judin (Moscow), in a paper on local anesthesia in major gastric surgery, was able to report as early as 1930 that he had successfully performed 5 total gastrectomies. One patient had syphilis of the stomach, and 4 had peptic ulcers. All were cured, which certainly is a remarkable result. In Judin's view this was due to the use of local instead of general anesthesia. My opinion is that his results were due to his excellent technic and to the fact that the patients had peptic ulcers. I should say that *total gastrectomy for peptic ulcer is not indicated*, no matter what satisfactory results have been achieved with it. Curved resection and the Kelling-Madlener technic have had very encouraging immediate and permanent results even with highly located ulcers. These procedures may be carried out by any surgeon who is familiar with gastrointestinal procedures.

The indication for total gastrectomy will be discovered, in most cases, only during the operation. In some cases the gastrointestinal roentgen series revealed carcinoma near the cardia and laparotomy disclosed its actual location to be far from the cardia, so that subtotal gastrectomy was adequate.

On the other hand, gastrectomy is not possible if there are peritoneal or hepatic metastases. Total gastrectomy as a palliative operation does not seem warranted to me, because of its high operative mortality. Old age and emaciation, however, do not contraindicate the procedure, since a life that would otherwise be lost may be saved by it. Of the 140 patients on which I performed this operation, 59 were from 60 to 70 years old (42 per cent); 24 were cured (40 per cent). Of Goto's 21 patients, 13 were under 50, and the oldest was 61. Undoubtedly the immediate results will be better in these comparatively young patients.

The type of anesthesia is of the utmost importance. Deep general anesthesia has been completely discarded. My first 3 patients were operated on with local anesthesia of the abdominal wall and mesenteric anesthesia with ether as an adjuvant. Since 1920 all patients have been subjected to spinal anesthesia. At first a 0.5 per cent solution of novocain was used, but because of the short duration of the anesthesia (one and one-half to two hours) it had to be repeated in most cases. Later I used

pantocaine in a 1:1,500 solution. For anesthesia of the abdominal wall and for spinal anesthesia, up to 300 cc. of this solution was injected. The resulting anesthesia lasted for three to four hours and did not require repetition. After 1945 pantocaine was not available, as it was supplied by the I. G. Farben Company in Germany, and I returned to the use of novocain and procaine. Procaine has a slightly shorter anesthetic effect than has novocain. In spite of this fact, it was not necessary to use ether even for short periods after the spinal injection had been repeated. The satisfactory results achieved with spinal anesthesia never called for high lumbar anesthesia, which is sometimes dangerous owing to its considerable depressive action upon the blood pressure.

Since no general or deep anesthesia was used, fatalities due to shock within the first twenty-four to forty-eight hours were avoided. The 5 fatalities that occurred within forty-eight hours after operation were due to a fatal duodenal reflex, and in 3 cases they were caused by acute mediastinitis caused by opening of the anastomotic suture line. In the last case death was due to coronary thrombosis with high-grade arteriosclerosis and syphilitic aortitis.

I always performed total gastrectomy *per laparotomiam*, since a high pressure apparatus for transthoracic operations is not at my disposal. (This apparatus should be available, however, because of the possibility of interfering with the contralateral pleura while the operation is in progress—even if the apparatus is necessary only upon closure of the thoracic cavity.) In order to achieve a better operative field for a medium-sized laparotomy, the left rectus muscle is severed. The xiphoid process is also removed, according to Lefèvre's suggestion. The left lobe of the liver is mobilized after severance of the ligament that runs to the left side of the diaphragm and to the spleen.

Total gastrectomy is performed only if the carcinoma has not extended to the adjacent structures and if the enlarged glands of the celiac axis can be radically removed, thus providing some chance of permanent cure. As in every gastrectomy for carcinoma, the greater omentum as well as the lesser should be removed up to the esophagus.

I always start total gastrectomy with severance of the duodenum, which I close in a typical way: The duodenum is ligated 1 cm. distal to the pylorus, and 1 cm. distal to this ligature I apply a purse-string suture. Proximal to the ligation I clamp the duodenum with a forceps and sever it by thermocautery. Then I invert the ligated duodenal stump, knot the purse-string suture and put two Lembert sutures on top. With this type of duodenal suture I have never encountered any leakage of the suture line, even in a normal gastrectomy.

Next I separate the greater omentum from the transverse colon and tie up the gastrosplenic ligament; then I remove the lesser omentum up to the esophagus. Ligation of the left gastric artery follows, and I try to avoid interfering with the ascending branch of this vessel, in order that the esophageal blood supply may be maintained. The esophagus is then mobilized by circumcision of the peritoneal cover on the diaphragm and pulled out of the mediastinum without producing tension. Just above the cardia two angular squeeze forceps (Wertheim forceps) are applied, and the esophagus is severed between them; thus the stomach is cut loose. A slit is made in the mesocolon, and the first jejunal loop is pulled into the upper abdominal quadrant and anastomosed with the esophagus. In my first 3 cases I performed an end-to-end anastomosis with the distal loop of the jejunum, which had previously been severed 20 cm. from the duodenojejunal fold. The proximal loop of the jejunum was implanted end to side in the efferent loop, producing thus a Y-shaped anastomosis. In my later cases I made an end-to-side anastomosis with the first jejunal loop, and the afferent and efferent loop were connected with a wide enteroanastomosis. The anastomosis between the esophagus and the jejunum is done with two rows of silk stitch sutures, and the anterior wall of the anastomotic loop is further fixed to the diaphragm with another line of interrupted sutures. Finally the slit in the mesocolon is attached to the jejunal loop with a line of sutures above the enteroanastomosis.

Because of the uncertainty of the anastomotic suture line, the upper abdominal area is drained, with one drain on each side of the anastomosis. In addition, a gauze strip is inserted in the left hypochondriac area and another is placed on the transverse colon in order to isolate the upper abdominal area completely from the free peritoneal cavity. In the first years during which I performed this operation I also did a jejunostomy in order to spare the anastomosis and to promote immediate nutrition. Owing to the reflux of bile ahead of the jejunostomy, frequent vomiting occurred, considerably endangering the esophageal suture line. I have discontinued primary jejunostomy for the past

nine years. However, I mark the site for a secondary jejunostomy, which is approximately 30 cm. distal to the enteroanastomosis, by doing three serosal stitches in a triangular arrangement, pointing distally. During the past nine years I have had to perform a secondary jejunostomy in only 10 cases, in each of them because nearly all food had left the fistula again.

The enteroanastomosis which is added to the end-to-side anastomosis has the objective of preventing pains that would be caused by retrograde filling of the afferent loop and of the duodenum. Furthermore, a large excavation is formed, which serves as a substitute for the stomach in the admission of food. Lahey, who in 1938 reported on 5 total gastrectomies with 5 cures, said that the enteroanastomosis is disadvantageous and that he never uses it in his own cases. In his opinion, the filling of the afferent loop, as demonstrated in every case by roentgenographic studies, is of definite advantage, since its enlargement is a substitute for the stomach. He has never observed the occurrence of any dyspeptic troubles as a result. Retrograde filling of the afferent loop, however, is likely to produce considerable discomfort after any gastrectomy performed by the Reichel-Polya method. To forestall these pains, Reichel, in an address to the German Surgical Congress in 1921, suggested enteroanastomosis between the afferent and the efferent loop.

When one is doing the end-to-side anastomosis, it may prove complicated to manage the posterior suture line in such a way as to avoid leakage. This is what I have been doing for the past ten years to prevent cutting through of the first suture line: I grasp the peritoneal cover of the pancreas, the leaf of the diaphragm and the posterior wall of the esophagus with the suture; then I tie the suture, and then I fix the jejunal loop with this suture. The four sutures are applied and then tied up. In order to avoid leakage of the suture line, some surgeons have tried to sever the jejunum and perform an end-to-end anastomosis between the esophagus and the efferent jejunal loop, connecting the afferent jejunal loop end to side with the efferent jujunal loop. By suturing the jejunum to the esophagus in several levels, one can invaginate the suture line into the jejunum. Seidl has modified the technic of the end-to-end connection between esophagus and jejunum; he omits a mucosal suture between the two structures and, instead, pulls the esophagus into the jejunal loop.

In order to achieve this, a catgut suture is made on the esophagus; then a forceps is inserted through a small incision in the jejunal loop, grasping the catgut suture and pulling the esophagus into the jejunum as far as possible. The seromuscular layer is fixed in a circle-like fashion to the esophagus by several interrupted sutures. On top of this a second and eventually a third row of Lembert sutures are superimposed, and the jejunum is also fixed to the diaphragm. Finally the afferent loop is sutured into the lateral mouth of the efferent loop, creating a Y-shaped anastomosis. With this procedure a piece of the esophagus 2 to 4 cm. long lies free in the jejunal cavity, and part of it becomes necrotic without producing leakage of the suture line. Seidl has used this method in 11 cases. He reported 3 fatalities, 1 due to pulmonary embolism, 1 to pneumonia and 1 to gangrene of the esophagus.

The suture line between esophagus and jejunum is unpredictable and complicated because the esophagus lacks a serosal cover, which is so important for the cohesion of the two structures. Therefore the cutting through of the suture line on the fifth to the seventh postoperative day may cause fistula formation or fatal peritonitis. Lefèvre (of Bordeaux) replaced the lacking serosa of the esophagus by wrapping the anastomosis in a serosal coat.

The first jejunal loop is severed 10 to 20 cm. away from the duodenojejunal fold, and both ends are closed with an uninterrupted suture line and Lembert sutures. The afferent and efferent loops are then connected to an extent of 3 to 5 cm. at their peritoneal origin by interrupted sutures. The esophagus is pulled out of the mediastinum for 3 to 5 cm. and the efferent jejunal loop is fixed to the leaves of the diaphragm and to the posterior esophageal wall with several interrupted sutures. Then the esophagus is severed 1 cm. above the cardia and an end-to-side anastomosis is performed with a double row of stitches 2 to 3 cm. away from the blindly closed end of the efferent loop. On top of this anastomosis the blindly closed afferent jejunal loop is fixed to the anterior wall of the esophagus and to the diaphragmatic hiatus by interrupted sutures. In a second suture line the afferent jejunal loop is fixed to the inferior aspect of the diaphragm. Finally the efferent and afferent loops are tied together at their margin, which is opposite the mesenteric border. Through this procedure the anastomosis and the inferior margin of the esophagus are completely wrapped in the serosa of both jejunal loops. Then an enteroanastomosis of the afferent and efferent loops is performed. No drain is placed in the abdomen upon closure.

After Lefèvre had communicated his method and his good results to me, I gave it a trial at once. I had a failure in the first case because of a particularly narrow jejunum; the two

loops compressed the esophagus, which became gangrenous and produced mediastinitis. The anastomosis, however, was completely segregated from the free peritoneal cavity. I have therefore modified Lefèvre's method in that I do not suture the intestinal loops together at their mesenteric origin; I suture them at the mesentery itself, 1 cm. away from the bowel, which prevents compression of the esophagus.

During the past two years I have generally used Lefèvre's method, or I have used the Y-shaped anastomosis, in which the posterior wall of the jejunal loop is fixed to the esophagus with a double suture line.

In cases of carcinoma of the cardia, resection of the upper half of the stomach may be carried out and the mouth of the stomach completely closed, an end-to-side anastomosis then being made between the esophagus and the distal stump of the stomach. In the best interests of a thoroughly radical gastrectomy, at least 3 to 5 cm. of the esophagus should be resected; therefore, the anastomosis is difficult to perform and the suture line is unreliable, even when the anastomosis is wrapped in the anterior wall of the stomach. I had 5 deaths in 8 operations of this kind. A transthoracic technic will probably make the suture line easier to maintain, and therefore the results may be expected to improve. I was obliged to send patients with carcinoma of the cardia (diagnosed by gastrointestinal roentgen and esophagoscopic study) to Denk's clinic, because I lack the apparatus for this method. Prof. Denk reported four years ago that his approach brings superior results. He told me personally that he had performed 43 transthoracic operations—36 resections of the cardia and 7 total gastrectomies, with satisfactory results. He will publish a report of his experience in the near future.

To Be Continued in June Issue

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Management of the Duodenal Stump in Operation for Penetrating Ulcer

PROF. DR. ALFREDO MONTEIRO, F.A.C.S., F.I.C.S. (HON.)*
RIO DE JANEIRO

EVERY surgeon who performs gastroduodenal operations should bear in mind the words of Owen H. Wangensteen's[1] sentence in his foreword to Rudolph Nissen's book "Peptic Ulcer":[2] "Every surgeon soon learns that satisfactory closure of the duodenum is the sine qua non of a low mortality score."

This was my own experience, especially when I was confronted with my first case of duodenal fistula. For simple gastric and duodenal ulcers the classic technics usually give satisfactory results. My own procedure underwent a marked evolutionary change when I decided to adhere to an aseptic technic, using sutures that did not involve the mucosa and therefore eliminated the hazard of a septic closed cavity.

At the beginning of my practice I closed the duodenal stump with two layers of sutures: (*a*) total suture and (*b*) seromuscular suture (Lembert). Eventually I abandoned the total suture and employed only the Lembert suture, using a clamp as in Mayo's method. Later I closed the stump, with or without crushing, by a seromuscular purse-string suture followed by an epiploplasty (Finsterer-Montenegro).

Lately, judging suture of the mucosa to be unnecessary and dangerous and to involve the septic closed cavity, I crushed the duodenal stump and applied first a temporary ligature and then a purse-string suture. When the ends of this suture were tightened, the thread of the ligature was cut with Barreto's guillotine. In my opinion this procedure is ideal, being strictly within the laws of aseptic surgery, except in the case of an edematous duodenum, in which the ligature may slip before the purse-string suture is knotted.

During the past few years, having at my disposal a modified Von Petz clamp with clips, devised by one of my collaborators (Eugenio de Souza), I began the use of this suturing instrument for duodenal closure, completing the operation with "U" stitches uniting the anterior wall of the duodenum to the sheath of the pancreas and following this with a complementary epiploplasty. I have never had bad results with either of the two technics. The second has proved more effective in cases of simple ulcer, owing to its simplicity, cleanliness and security.

If surgeons are desirous of adopting the safest and most secure technic for nonpenetrating ulcers—to avoid the most dramatic complication, a duodenal fistula after gastric resection—does it not stand to reason that even more should be demanded of a technic for penetrating ulcers?

Early surgeons, to avoid such complications, resorted to simple derivations in the form of gastroenterostomies. In view of the bad results, Finsterer,[3] in 1918, proposed his "resection by exclusion," which, although it had merit, still did not give the good results obtained by resection with excision. Finsterer admitted the deficiency of his technic in certain cases and proposed to complete it by excision of the mucous membrane of the antrum and pylorus. His technic won world-wide recognition. Meanwhile, Nissen[2] in Germany and Pauchet[4] in France protested against gastrectomy by exclusion, and each established a technic, the two being fundamentally similar. The new method was called Pauchet-Nissen's and was based on the following principles:

1. Leaving *in situ* the base of the ulcer crater, but interrupting its communication with the duodenal lumen.

2. Mobilizing the anterior wall of the duodenum (Nissen-Clairmont) and suturing it to the capsule of the pancreas.

3. Performing a complementary epiploplasty.

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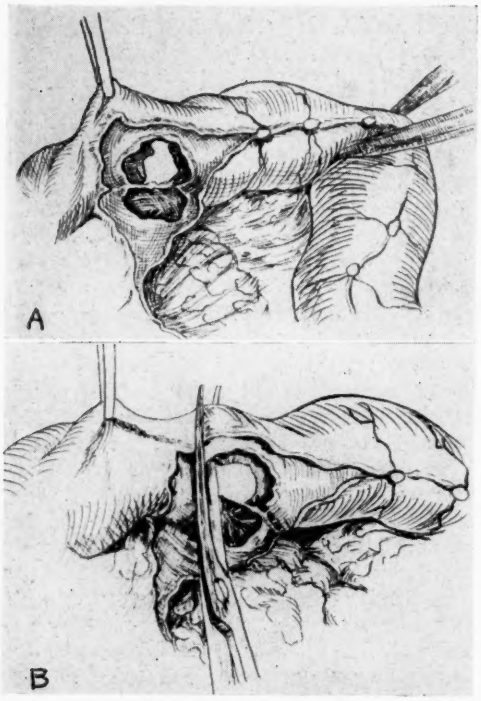

Fig. 1.—*A*, technic of mobilization of duodenum in ulcer of posterior wall. After mobilization of anterior wall and devascularization of antrum and pylorus, crater is opened close to greater and lesser curvatures. *B*, scissors applied for dividing anterior wall. Dotted line indicates incision completing exposure of crater.

SIMILAR PROCEDURES

Nowadays all surgeons who perform radical resection for penetrating duodenal ulcer do so essentially by the Pauchet-Nissen method or one of its variations. This technic is too well known to require description. I shall therefore describe only the mucosal cylinder method and the technical variations of the Monteiro school of surgery.

Dissection of the Duodenal Mucosal Cylinder (Collarette de Pauchet, 1933).—Credit must go to the French surgeon Victor Pauchet[4] for being the first to tackle in an efficient and practical way the resection of penetrating ulcers of the duodenum and stomach. Nissen himself (1945) admitted being inspired by the work of Pauchet on gastric surgery to systematize his procedure in relation to the duodenum. The French surgeon attacked this problem as early as 1927. He divided the duodenum below the ulcer, dissected the mucosal cylinder (collarette) and then resected it to diminish the volume of the duodenal stump; then he united the anterior wall of the duodenum to the sheath of the pancreas by two rows of sutures completed by a pedunculated segment of omentum tacked over the line of closure.

What is the difference between this method and the one called Nissen's? An unadvisable variation; that is, fixing the duodenal wall to the borders of the ulcer crater. Nissen's first publication appeared in 1937, when he pointed out an interesting factor of a more secure technic, which Pauchet had not insisted upon—preliminary mobilization of the anterior duodenal wall.

Detachment of the Submucosa (Hustinx-Montenegro).—According to Alberto Gutierrez,[5] Hustinx in Holland began in 1928 to use a method for deeply rooted duodenal ulcers which can be included among the various methods of submucosal detachment recommended by Benedicto Montenegro.[6] The illustration presented by the Argentine surgeon Guttierez shows a slight modification of the technic presented by Hustinx[7] in 1936.

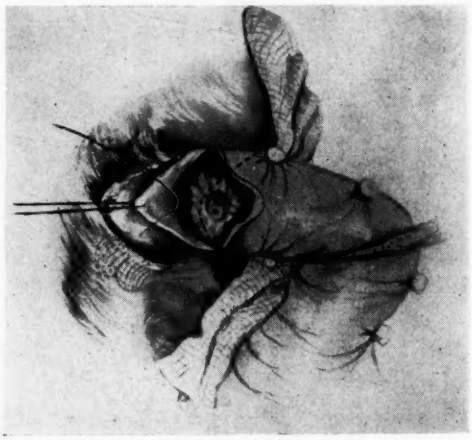

Fig. 2.—Small bleeding ulcer of posterior wall perforating into pancreas. After devascularization of pyloric region of stomach, anterior wall is opened by a semilunar incision; gauze sponge secured by a long thread is introduced into distal duodenal lumen. Posterior wall is incised through all layers from within, as shown by dotted line.

In 1937, Xavier Delore and Jean Braine[8] described at the Academy of Surgery of Paris a technic that one of them (Delore) had been practicing since 1925. Transcribing the words of the text, one sees that the procedure is identical to that of Hustinx-Montenegro:

"Apres la liberation du duodenum, le chirurgien incise circulairement ce duodenum sans etamer la muqueuse; grace au plan de clivage situe entre la seromusculeuse et la muqueuse, il peut alors decoller cette muqueuse sur une longueur variable. Le decollement acheve, le cylindre muqueux est lie au ras de la collerette musculo-sereuse avec un fil de catgut, puis sectionne au-dela du fil. La surface de section est touche a la teinture d'iode, le fil de ligature est coupe et le moignon duodenal se retracte dans le manchon musculo-sereuse. Ce manchon est alors suture en bourse, en un ou deux plans, ce qui assure une etanchite absolue; par dessus la suture, nous appliquons enfin un peu d'epiploon."

An interesting point is that, according to these surgeons, the method cannot always be used: "Notably it can be applied in cases of edematous and infiltrated duodenum or when in immediate contact with an ulcer." But it is just here that Pauchet, Hustinx and Montenegro use the method in cases of penetrating ulcers of the duodenum.

It is always difficult to assign priority for a method. Anglo-Americans and Central Europeans claim this method as Nissen's, though actually the pioneer was Pauchet. The technic of detaching the submucosa was recommended by Delore, before Hustinx and Montenegro. The technic of the Brazilian surgeon is the most nearly perfect, and his impressive statistics speak for themselves.

In what does the Pauchet method differ from the Hustinx-Montenegro technic? Pauchet dissects the sleeve to diminish the volume of the duodenal stump, while Hustinx and Montenegro use the dissected cylinder, preferring to ligate it at its base and insure a safer closure of the stump.

TACTICAL VARIATIONS OF THE ALFREDO MONTEIRO SCHOOL

Is it necessary to diminish the volume of the stump in order to facilitate its closure? I do not believe so.

Would a more secure closure be obtained by

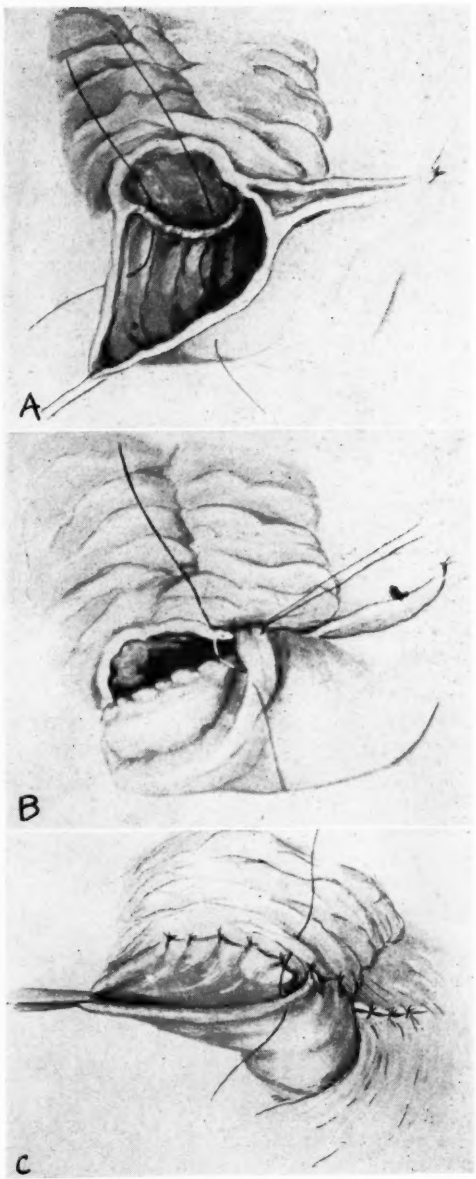

Fig. 3.—Closure of duodenal stump. *A*, first layer of interrupted sutures inserted through distal margin of ulcer and all layers of edge of anterior wall. *B*, second row inserted through proximal margin of ulcer and a seromuscular fold of anterior wall. Cut edge of duodenocolic ligament closed. *C*, third row inserted through capsule of pancreas and another more distal seromuscular fold of anterior wall.

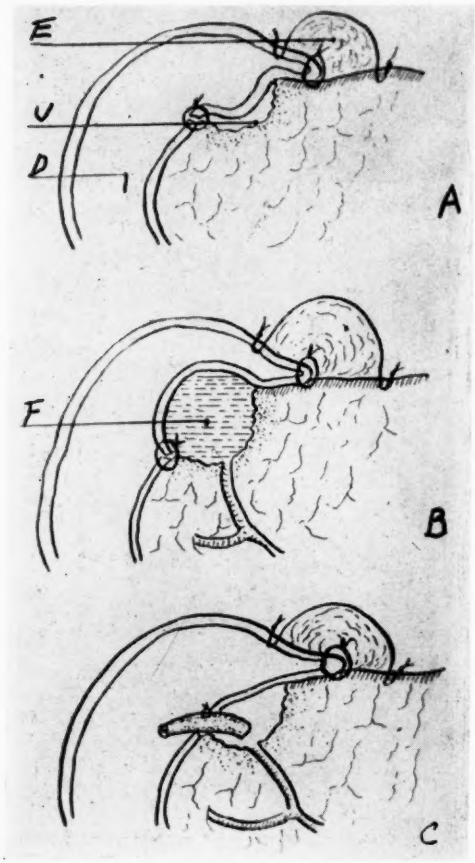

Fig. 4.—Closure of duodenal stump. *A*, longitudinal section of atypical ulcer closure; *D*, duodenum; *U*, ulcer; *E*, epiploon. *B*, atypical closure in presence of accessory pancreatic duct with effusion of pancreatic juice into surgically closed space; *F*, pancreatic fluid collection. *C*, rubber tube inserted and fixed to anterior wall of duodenum to insure escape of pancreatic fluid into duodenum.

ligating the base of the devascularized cylinder? I do not believe so.

For some time I practiced detachment and dissection of the submucosa according to the technic of Montenegro, with satisfactory results. The procedure is interesting and artistic and is satisfactory as a rule, even when the common duct is involved in the fibrous tissues surrounding the ulcer. Eventually I abandoned suture of the mucosa in general. Dissection of the sleeve prolongs the operation, causes loss of blood and prolongs the septic time, all for the sake of another layer of sutures; and this layer has no practical value, since this mucosa, deprived of circulation, rapidly becomes necrotic.

The secret of a good duodenal closure lies in mobilization of the anterior wall, which sometimes requires freeing from its parietal attachments (Kocher's maneuver). To be sure of avoiding injury to the common duct, when operating in a fibrous area surrounding the ulcer, place a T-tube into the common duct (Lahey) or locate it by means of preliminary liberation of anterior duodenal wall.

In this clinic it is routine, in the case of a penetrating ulcer, to divide the stomach and perform a gastrojejunal anastomosis before tackling the ulcer itself. The stomach having been freed, one can more safely approach the fixed part of the duodenum. With small and medium-sized ulcers it is possible to avoid exposing the crater. This is accomplished by placing a forceps below the ulcer, from the

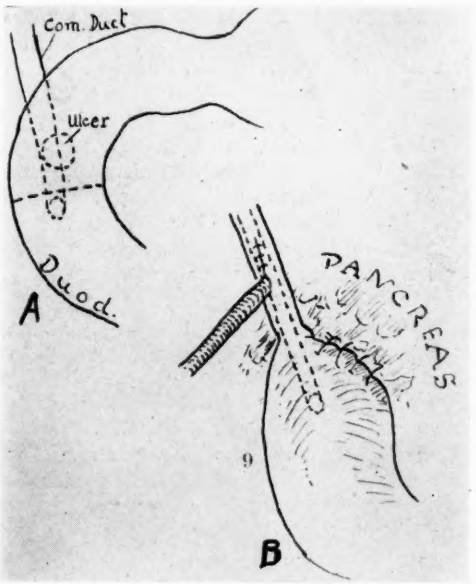

Fig. 5.—Lahey's method of protection in posterior wall ulcer adherent to common duct. *A*, location of ulcer in relation to common duct; level of dissection marked by dotted line. Ulcer crater apparently far proximal to line of resection. *B*, T-tube prophylactically inserted in common duct to avoid obstruction of duct by suture or by inverted stump. Final result.

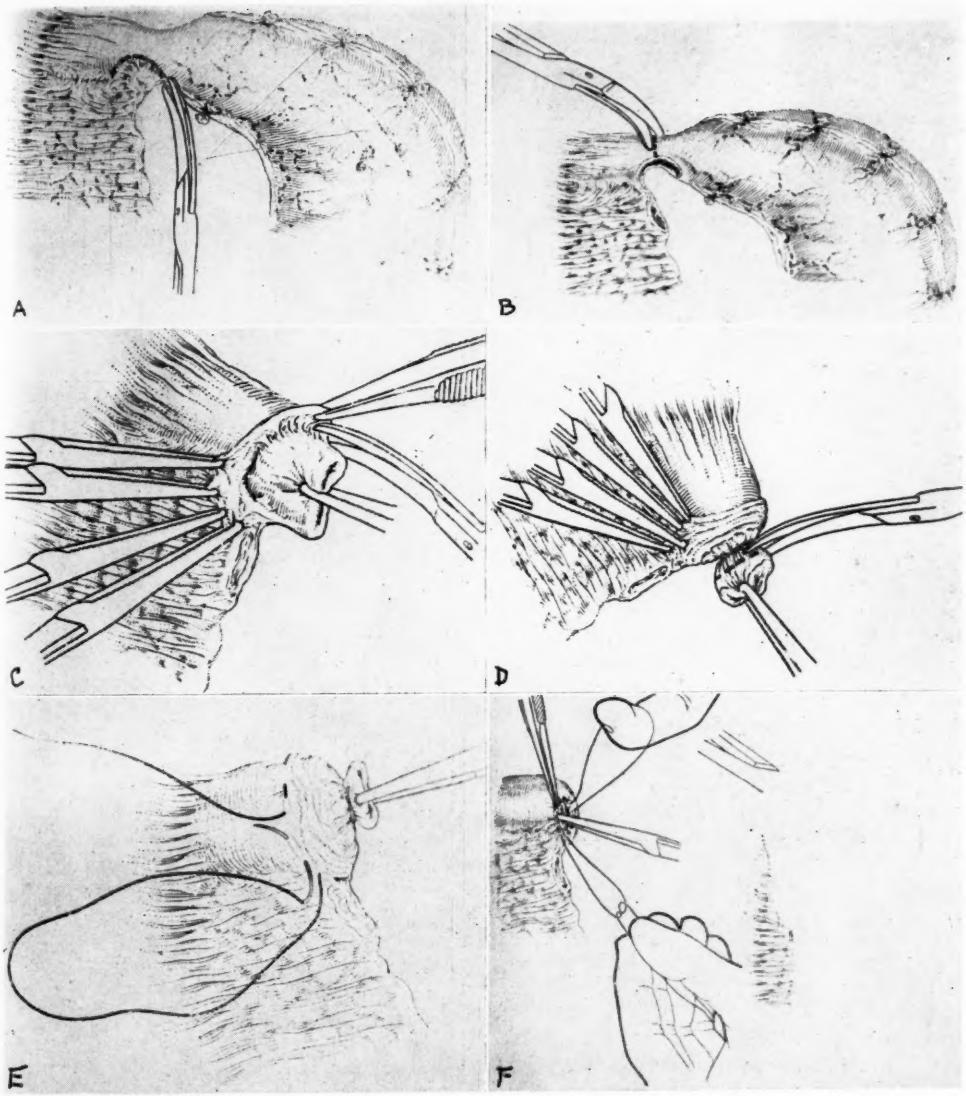

Fig. 6.—Montenegro's technic of submucosal detachment. *A*, division of duodenum bypassing the crater. *B*, completion of division of circumference of duodenum. *C*, submucosal detachment. *D*, cylinder dissected and ligated and excess resected. *E*, purse-string suture for anterior duodenal wall and sheath of pancreas. *F*, knotting of purse-string suture, completed by epiploplasty.

free to the attached borders of the duodenum, and dividing the same above the instrument. This maneuver is followed by resection of the proximal part of the duodenum, bypassing the crater.

At this point one of three variations—Monteiro's, Barreto's or Freitas'—may be used.

Monteiro Variation.—Having applied the seromuscular suture over the forceps clamping the duodenal stump, I place a fringe of epi-

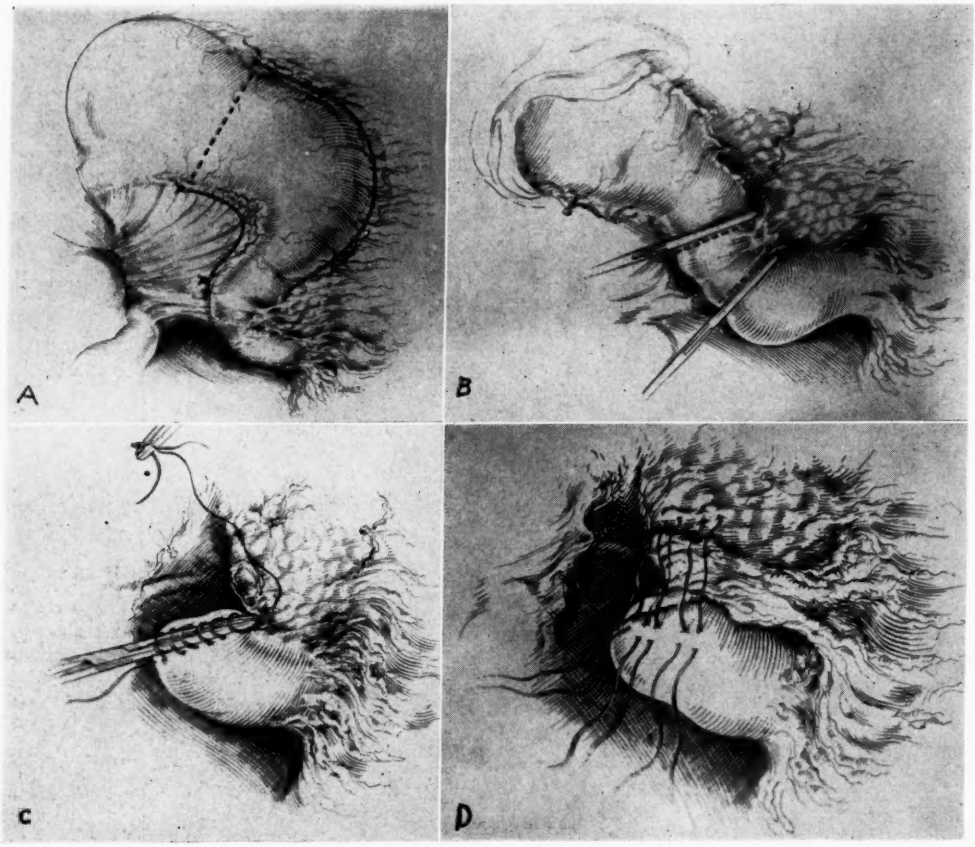

Fig. 7.—Monteiro's variation. *A*, devascularization of stomach. Dotted line denotes previous division of stomach, immediately followed by gastrojejunal anastomosis. *B*, the part of stomach mobilized and to be resected allows easy access to the duodenum. Postion in which forceps are applied and ulcerous area are visible between them. *C*, withdrawal of proximal part of duodenum and closure of stump over forceps. *D*, after closure of duodenum, a segment of omentum is drawn over the crater; anterior wall of duodenum and sheath of pancreas sutured together over the omentum. Then a part of the segment of omentum is turned back over and sutured to the duodenum and the pancreatic capsule (loop epiploplasty).

ploon between the stump and sheath of the pancreas, and follow this by "U" stitches uniting the anterior wall of the duodenum to the capsule of the pancreas; the segment of omentum mentioned is then passed over this suture line and attached to the pancreatic capsule and the duodenal wall.

Barreto Variation.[9]—After dividing the stomach and performing the gastrojejunostomy, I retract the stomach and proceed with freeing the duodenum; first along the lesser curvature and posteriorly, then along the anterior surface, the free margin and the posterior surface. Having thus localized the ulcer, I try to create a passage between the duodenum and the pancreas below the lesion. Difficulties may be encountered because of infiltrated tissues and the presence of duodenopancreatic vessels. To overcome this difficulty, I place a forceps obliquely from the free margin to the attached margin of the duodenum, avoiding contact with the pancreas as far as possible and reaching to an area below the ulcer. A strong, straight forceps is applied directly

above the first one. If the duodenum can be freed on all sides, the forceps are applied with more precision and remain throughout the period desired. From the superior end of the ulcer to the free margin I place another forceps. (An elbowed instrument is easier to manipulate.) The coprostasis completed by the forceps I continue by isolating the segment of duodenum corresponding to the ulcer. Then, with a diathermic blade, I proceed to resect the affected area. In this manner I obtain an obliquely divided duodenum, closed off by two superimposed hemostats. I then adjust the inferior hemostat, once in control of the duodenal opening, and withdraw the superior one. With a simple No. 1 catgut I perform a simple continuous suture over the forceps, following Mayo's technic. This done, the ends are tied together, the two points of the stump being turned toward the base. Separate stitches are then applied with No. 000 silk or fine cotton thread from one surface to another, invaginating the stump. The stump is then drawn over the ulcer site and sutured to the sheath of the pancreas. Finally a segment of pedunculated omentum is applied over the duodenopancreatic suture.

Josias de Freitas Variation.[10]—Figure 8 shows the operative procedure. My collaborator differs in one point—that is, in not suturing the stump to the capsule of the pancreas. The reason is that these stitches pass through pancreatic tissue and frequently provoke hyperglycemia. This has been duly proved by myself but appears to be of little importance.

In conclusion, it can be stated that it is not always possible to isolate the duodenum without previously exposing the ulcerous crater. In such cases it is impossible to proceed in the clean manner heretofore described. The best procedure then is to suture the duodenal mucosa without any dissection, then fix the anterior duodenal wall to the sheath of the pancreas, and to follow these steps with a complementary epiploplasty.

SUMMARY

The author discusses closure of the duodenal stump in cases of ulcer of the duodenum penetrating into the pancreas, referring especially to his personal experience. He cites five phases of technic in simple cases: (*a*) closure with two layers of sutures (common technic); (*b*) Mayo's technic; (*c*) Finsterer-Montenegro and Doyen technics (ligature and purse-string suture); (*d*) avoidance of the septic closed cavity; and (*e*) use of the small modified Von Petz clamp devised by Eugenio de Souza.

As to penetrating ulcers, the author considers three periods: (*a*) the period of gastroenterostomy; (*b*) the period of resection by exclusion (Finsterer); and (*c*) the Pauchet-Nissen resection. He favors resection, and considers the Finsterer technic not satisfactory.

The author discusses variations of the Pauchet-Nissen method, including the Hustinx-Montenegro dissection and the three variations of the Monteiro school.

RESUMEN

El autor examina el cierre del muñón intestinal en los casos de úlceras del duodeno

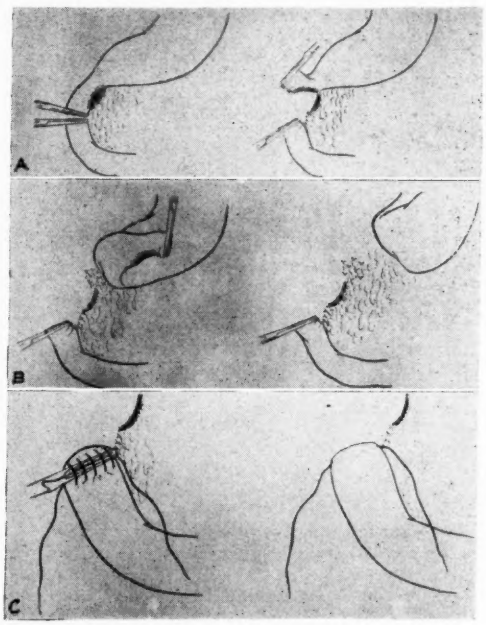

Fig. 8.—Josias de Freitas' variation. *A*, two forceps placed directly under ulcer after devascularization of stomach and duodenal mobilization (avascular zone). *B*, division of duodenum between forceps and resection of proximal part, bypassing crater. *C*, total suture over forceps (transfixing or not), followed by second layer of sutures, nonperforating, invaginating the first. Completed by epiploplasty.

penetrantes en el páncreas reficiéndose de un modo especial a su experiencia personal. Menciona el autor las cinco fases en que se divide la técnica en los casos sencillos: a) cierre mediante dos estratos de suturas (técnica corriente); b) técnica de Mayo; c) técnica de Finsterer-Montenegro y Doyen (ligadura y sutura en cordón de cierre de bolsa); d) manipulación operatoria para evitar la formación de un cavidad séptica cerrada; y, e) empleo de la pinza pequeña de Von Petz modificada que ha sido desarrollada por Eugenio de Souza.

En cuanto a las úlceras penetrantes, el autor examina tres períodos: períodos de la gastroenterostomía; b) período de la resección (Finisterer); y c) resección de Pauchet-Nissen. El autor favorece la resección y considera que la técnica de Finsterer no es satisfactoria.

El autor examina las variaciones del método de Pauchet-Nissen incluyendo la disección de Hustinx-Montenegro y las tres variantes de la escuela de Monteiro.

RÉSUMÉ

Cet auteur décrit la suture du tronçon duodénal dans des cas d'ulcère du duodénum pénétrant dans le pancréas, considérant surtout ses propres cas. Il décrit les 5 stades de sa technique dans les cas simples: (a) fermeture avec deux rangs de sutures (technique commune); (b) technique de Mayo; (c) techniques de Finsterer-Monténégro et de Doyen (ligature et suture en bourse); (d) prévention de la cavité septique fermée et (e) emploi de la petite pince Von Petz modifiée par Eugenio de Souza.

Quant aux ulcères pénétrants, l'auteur considère trois phases: (a) la phase de la gastroentérostomie; (b) la phase de résection par exclusion (Finsterer) et (c) la résection de Pauchet-Nissen. Il préfère la résection et considère la technique de Finsterer non-satisfaisante.

L'auteur discute les variations de la méthode Pauchet-Nissen y compris la dissection de Hustinx-Monténégro, et les trois variantes de l'Ecole de Monteiro.

RIASSUNTO

Discute la chiusura del moncone duodenale nei casi di ulceri penetranti nel pancreas, con speciale riguardo alla propria esperienza. Cita cinque metodi applicabili ai casi non complicati: a) chiusura con due piani (tecnica comune); b) tecnica di Mayo; c) tecnica di Finsterer-Montenegro e di Doyen (legatura e sutura a borsa di tabacco); d) eliminazione di una cavita' settica chiusa; e) uso di una piccola pinza modificato di Von Pitz, ideata da Eugenio de Souza.

Per quanto riguarda le ulceri penetranti l'A. prende in considerazione tre procedimenti: a) gastroenterostomia; b) resezione per esclusione (Finsterer); c) resezione secondo Pauchet-Nissen.

La resezione sarebbe il metodo migliore: ma l'A. non si dichiara favorevole alla tecnica di Finsterer. Egli discute possibili variazioni del metodo di Pauchet-Nissen, includendo nella discussione la dissezione secondo Hustinx-Montenero e tre variazoni secondo la scuola di Monteiro.

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Polyposis of the Stomach with Intussusception into the Duodenum

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POLYPOSIS of the stomach is comparatively rare. At the time when the case here described came under surgical treatment there had been only 100 cases reported in the literature (Sinclair, *British Journal of Surgery*, 1933). The condition may present a variety of symptoms and cause difficulty in diagnosis. It is therefore incumbent on every surgeon to publish details of any such case so that the symptoms may be made clearer.

REPORT OF CASE

Harriet M., a married woman aged 63, was admitted to St. Mary's Hospital, Paddington, on Jan. 21, 1933, with a history of abdominal pain and vomiting after taking food for the past two years. Five days before admission she had had a more violent attack of vomiting, and her medical attendant (the late Dr. D. D. Rosewarne) had observed a sausage-shaped swelling, which he attributed to duodenal spasm; he commented that the swelling disappeared under the influence of morphine and belladonna. Since that attack she had been unable to take solid food without vomiting almost at once. Vomiting was always followed by epigastric pain. There had been no hematemesis, and the bowels were open regularly.

The patient was thin and rather feeble. Examination of the blood showed 4,300,000 red cells per cubic millimeter, but the value for hemoglobin was only 75 per cent.

Examination showed a lax abdominal wall, with some deep tenderness in the left hypochondrium. A palpable but not easily definable lump was observed below and to the left of the umbilicus. There were no other notable physical signs.

Roentgen examination of the stomach revealed a persistent filling defect, which involved the whole of the pyloric portion of the stomach. The roentgenologist had no doubt that this was due to carcinoma. There was an eight-hour residue in the

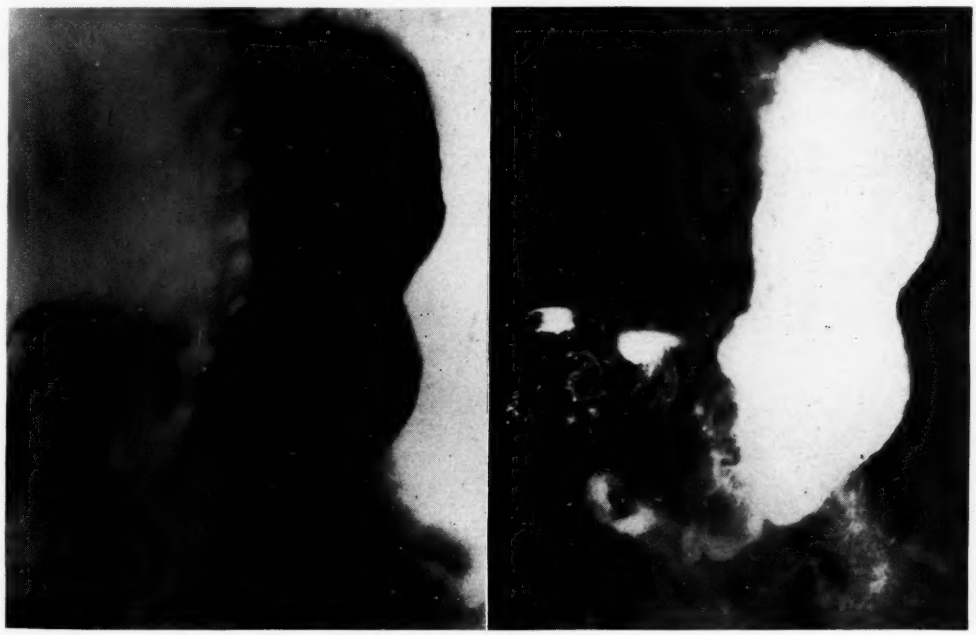

Fig. 1.—Roentgenograms taken after barium meal.

stomach. The passage of the barium through the remainder of the intestine presented no abnormal features.

The preoperative diagnosis was carcinoma of the stomach, and on February 9 the abdomen was explored, with the patient under general anesthesia. The stomach was extremely vascular. There was a swelling involving the pyloric part of the stomach and the first part of the duodenum. On palpation one felt something like a polypoid growth. Partial gastrectomy was performed by the Billroth I method. The duodenum was much dilated, and the growth had been intussuscepted into the duodenal lumen. There were no complications after operation, and the patient left the hospital on March 6. She remained comparatively well for some years but still suffered occasionally from indigestion.

The pathologic diagnosis was multiple adenomatous polypi of the stomach.

COMMENT

It is clear that the difficulty in this case was caused by intussusception of the growth and the pyloric part of the stomach into the duodenum. The duodenal swelling observed by the patient's physician and its disappearance under the influence of belladonna and morphine can only have been due to such an intussusception. The accompanying illustration shows that the duodenal lumen was dilated to a size as great as that of the pyloric part of the stomach.

Fig. 2.—Polypoid mass intussuscepted into duodenum.

The recurrence of "indigestion" after operation may well have been due to the growth of more polypi, for it will be noted that the section of the upper part of the stomach cut across a few scattered polypi.

The mistaken diagnosis of carcinoma was natural when the roentgen film showed a complete filling defect in the pyloric region. This must have been due to the intussusception occluding the first part of the duodenum. If another film had been taken later it is likely that the cluster of polypi would have shown up as a partial filling defect in the pyloric antrum.

SUMMARY

A case of polyposis of the stomach in a woman aged 63 is reported, in which a mistaken roentgen diagnosis of carcinoma was made preoperatively. On laparotomy it was found that a large polypoid growth had been intussuscepted into the lumen of the duodenum. Operation was followed by an uncomplicated recovery. The pathologic diagnosis was multiple adenomatous polypi of the stomach.

RÉSUMÉ

On rapporte le cas d'une importante excroissance polypoide de l'estomac, intéressant le duodenum. On fit à la radio, un diagnostic erroné de carcinoma. L'opération fut suivie d'une guérison sans complications.

RESUMEN

Se ha descríto un caso de tumor poliposo gastrico con intususcepcion en el duodeno, diagnosticado erroneamente por el radiólogo como un carcinoma. La convalecencia despues de l'operación fué normal.

Basic Factors in Scientific Research*

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In the prologue to *Gargantua* Francois Rabelais[1] says:

> Did you ever see a Dog encountering some Marrow-bone? He is, as Plato says (Book II, *The Republic*), the most philosophical animal in the World. If you have seen him, you may have noted with what Devotion he watches it, with what Care he guards it, how fervently he holds it, with what Prudence he gobbets it, with what Affection he breaks it, and with what Diligence he sucks it. What induces him to do this? What is the Hope of this Research? What good does he set before him? Nothing more than a little Marrow.

THE majority of scientific investigators are seeking just that—just "a little Marrow." Few indeed seek to discover accidentally, as Columbus did, a whole New World. Few expect to see their names emblazoned along with those of Pasteur, Ehrlich and Freud. They do what the Germans used to call somewhat apologetically an "Arbeit"; and if it gets published they are satisfied. Moreover, they can always send out reprints.

As the middle of the twentieth century approaches, the creation of a National Science Foundation has received the dignity of special mention in a Presidential message. "Research" has become the most potent word for use in the solicitation of funds for a great variety of purposes. The progress of science is recognized as the key to providing more and more of all that is good for more and more people. We may well inquire as to the basic factors involved in promoting, encouraging and supporting research. Many of the distinguished investigators of the past left records of the paths by which they attained their achievements. Their writings provide hints as to what we may do toward intensifying the speed of research and broadening its scope. Perhaps the secret lies in the laconic three-word message John Hunter wrote to Edward Jenner when the latter advanced his views on hibernation in the hedgehog: "Don't think, try!" Simply to experiment is not, however, the answer. Sir Walter Langdon Brown said: "John Hunter was first to regard medicine as a branch of experimental biology. His famous aphorism 'Don't think, try!' may have been misinterpreted, but never more sardonically than by a friend of mine who commented that 'out of respect to John Hunter, the medical profession for more than a century had been trying not to think.' "[2]

During the last ten years I have been privileged to sit with various boards and committees of the National Research Council, particularly in the Division of Medical Sciences; also on the scientific advisory boards of such scientific foundations and groups as the National Foundation for Infantile Paralysis, the American Heart Association, the Arthritis and Rheumatism Foundation, and the various scientific councils of the American Medical Association. For some two years I have been associated with the Committee on Veterans Medical Problems. In these capacities I have had opportunity to consider, along with many of the leaders in science in the United States, hundreds of applications for grants of funds to support research in leading universities and scientific institutes. Invariably, questions arise: What is research? Can this man do research? Has he adequate facilities and personnel to undertake a project such as the one proposed? Has he allowed for overhead? Are we supporting teaching in that university? What other grants does this man get? Occasionally, is he asking for enough money? Has he already got a biochemist? Who is his statistician?

I have been conducting a little bibliographic or literary research of my own to find the essential qualities that characterize an investigator, the mechanisms by which research of note has been accomplished, the habits of thought, reasoning and logic—the mental processes—that result in great inventions and discoveries. I wish that some formula could be derived from these studies to guide deans of medical schools, professors of the biological

*Address to the Chicago Literary Club, Jan. 9, 1950.

sciences, directors of research institutes, and philanthropists of good will in selecting investigators or projects for investigation.

At this point, if I were to follow the custom of many writers, I could introduce the word "semantics" and call for definitions of science and of research. By a process of exclusion, I could, no doubt, toss out of consideration tons of theses published in pursuit of the degree of master of some science or the degree of doctor of philosophy. I have observed theses on "The Nocturnal Attitudes of the Cockroach," and on "The Drinking Habits of the Honey Bee"! As long as universities grant the degree of doctor of philosophy for theses built on questionnaires, weird projects will entice investigators. We must not be snobbish, however, in our choice of subjects for investigation. The lowly cockroach, bed bug and louse have already achieved criminal importance as dispensers of disease, and we cannot neglect them.

President Conant, in a recent group of essays,[3] defined science by saying that it "emerges from the other progressive activities of man to the extent that new concepts arise from experiments and observations, and that new concepts in turn lead to further experiments and observations." This definition indicates the continuously dynamic character of science. As for the so-called "social scientists," President Conant considers the field of their observations, the duration of their studies and their accumulation of facts so insufficient that he prefers to call them social philosophers, thus saving their dignity and at the same time placing them near the top of the intellectual caste system of the universities, along with the mathematicians.

For some years I have emphasized a point on which there is general agreement, namely, that the progress of medical and related sciences depends in large measure on the invention of new devices and systems of measurement which extend the senses of the investigator beyond the limitations established by the nature of man or by previous inventions. More than fifteen years have passed since Professor J. B. S. Haldane[4] wrote:

> Research, although at first sight so different from invention, consists largely of the design and perfection of apparatus for observation and measurement. A few months ago I met Professor Hertwig who was the first to observe the actual process of fertilization by the fusion of the nuclei of an egg and a spermatozoon. About a third of modern biology is based on this simple fact which every educated person today takes for granted. My wife asked me whether I thought there were many discoveries at once as simple and as important to be made in the realm of biology by mere observation. Personally I do think so, but they will depend on the invention of new means of observation as powerful and ingenious as the microscope, which had undergone two hundred years of development when Hertwig made his great discovery.

Consider in this connection the extension of medical knowledge resulting from the invention of the watch, the manometer, the stethoscope, the ophthalmoscope, the laryngeal mirror, and the electric light. How many thousands of medical investigations have depended on the simple application of such devices to a variety of diseases and disorders! What a vast product of research has resulted from the invention of new culture media, or from any of the instruments that write records of function of such organs as the stomach, the heart, the lungs and the muscles! What would the physiologist be without his kymograph, the cardiologist without his electrocardiograph, and, more recently, the neurologist without his electroencephalograph? The sense of sight has been immensely prolonged and extended by the ophthalmoscope, the rhinoscope, the otoscope, the esophagoscope, the gastroscope, the cystoscope, the proctoscope, the peritoneoscope, the bronchoscope, the microscope and the telescope. As each of these devices has appeared, a new specialty has developed. Floods of manuscripts, simply recording new observations, are catalogued as research. The basal metabolic apparatus, the roentgen ray and the electrocardiograph have created new specialties and specialists. In their strivings to make their specialties more truly scientific the psychologists and the psychiatrists invent new technics of measurement such as the Binet-Simon test, the Rohrschach test, the Minnesota multiphasic personality test, the draw-a-man test, and many others which seem sometimes to offer more information about the tester than about the testee. A few radioactive isotopes and a Geiger counter can make any doctor a research man in the field of atomic energy and physiology.

As I have already emphasized, the words "scientific research" have become a slogan with which to conquer. Sir Farquhar Buzzard,[5] eminent British neurologist, said in his Maudsley Lecture:

> The man in the street is familiar enough with the term "scientific research," but has little conception of how scientific observations are registered and controlled, how deductions are tested and hypotheses scrapped. He lives in another world, and is content to welcome a "new discovery," sensational enough to attract notice in the press, as a bolt from the blue, or as a species of miracle, and to accept it without interest in its origin, its evolution, or the authority on which it is proclaimed.

The education necessary for an investigator includes training in a number of fields, among which English composition and mathematics are certainly not the least essential. The education of the investigator must be exceedingly broad, embracing not only training in the scientific method, but also some knowledge of history, economics, philosophy, art, anthropology, and as many different basic sciences as he can possibly encompass. Cultural education is vital to the highest achievement. Some have insisted that the training offered by the German gymnasium was the ideal preparation for the investigator in the field of medicine and that this preparation accounted for the leadership held by central Europe in medical investigation in the middle of the nineteenth century. The subject has been extensively debated and is as fresh today as when it was first tossed into the arena of scholastic consideration. Chancellor Robert M. Hutchins,[6] in a report on his twenty years of administration in the University of Chicago, writes:

> The American University in its present form is the outgrowth of the justifiable enthusiasm felt by the men of the nineties for the universities of Imperial Germany. The extreme specialization of the German universities and their devotion to research, however, were educationally possible and socially tolerable only because of the humanistic Gymnasium, which laid the foundations of liberal education upon which the German university was erected.
>
> In the United States the college, upon which the graduate school was imposed, and the high school, upon which the college rested, were disintegrating at about the time that universities on the German model began to arise. The American university today is a great many things that the German university never thought of being; an athletic establishment, a health resort, a vocational school, and a place to have a good time, and acquire the social graces. But in so far as research is concerned, the American university is a *ci-devant* German university. Unfortunately, it is a German university without its foundations.

As one proceeds with Mr. Hutchins' report one finds him urging that the vocational object of professional schools is accidental rather than essential; that "the way to learn how to practice anything is to practice it"; that "the University has held that all its professional schools should be devoted to research"; that "the University of Chicago Medical School is a full-time research institution. All the members of the faculty derive their income from the University in the form of salary. The patients' fees go to the University and not to the doctors." All this offered in a sort of triumphant crescendo seems to be a challenge, a defense of the system! Do these details of administration and university economics really have anything to do with the basic factors of scientific research? No doubt the conditions under which research is prosecuted, and the environment of the investigator, affect the facility with which the work is conducted, as well as the extent of production of scientific facts and of well trained personnel. From the point of view of genetics, they may concern even the breeding and rearing of investigative geniuses. I doubt, however, that full-time or part-time, all-salary or part-salary, royalties from books or no royalties, income from patients or no income, are basic factors. They did not concern Ramony Cajal, Claude Bernard, or Rene Laennec.

THE BIOGRAPHICAL AND AUTOBIOGRAPHICAL EVIDENCE

Dr. Walter Bradford Cannon,[7] in his autobiographical study of the qualities that make for leadership in investigation, begins by enumerating some of the factors that may hinder rather than help:

> I have been more and more impressed by the occasional lack of one or another of the essential qualities in a man, that spoils his otherwise excellent equipment in mind and character. As an investigator he may, for example, be rich in suggestive ideas and yet be indolent and therefore sterile; he may be a hard worker but secretive about his results and suspicious of his fellow

> workers, so that he is despised by them; he may be an earnest experimenter but inconsiderate of his helpers, and therefore he may find that help is begrudged him; or he may be prone to display an attitude of superiority and consequently be subjected to derision, expressed or silent. Sometimes an investigator's excellence in important regards is so great that it over-balances his defects. I have heard of an eminent scientist who, after weeks of intense and exhausting labor on a difficult problem, would break away in a disgraceful carouse. His escapades were tolerated because of his outstanding discoveries.

Cannon holds that "the experimental method, in which the conditions to be observed are held under control, is in the main the distinguishing feature of modern science. . . . What the experimenter is really trying to do is to learn whether the facts can be established which will be recognized as facts by others and which will support some theory that in imagination he has projected. . . . The experimental method requires ingenuity and skill in contriving appropriate devices for securing the evidence needed to learn whether an idea is valid or not." And here let us not confuse the tools of science with science itself! Mathematics, as was pointed out by President Conant, is the language of science. Similarly, ability to describe the experiment and the hypothesis on which the experiment is based is part of the investigator's armamentarium. To quote Cannon again: "The scientific observer should be able to write a clear and definite report of his aims, his methods, his results and his conclusions." In his consideration of the fitness of an investigator for research, Professor Cannon concludes:

> In listing the traits which have seemed to me important for a career of investigation—curiosity, imaginative insight, critical judgment, thorough honesty, a retentive memory, patience, good health, generosity, and the rest—I have not attempted to weigh their relative values. Anyhow, that would be difficult. A beginner, who seriously plans a life of productive scholarship, should not be disheartened if he thinks his qualifications do not meet requirements. Training and practice may not lead to perfection, but they will surely compensate for early inadequacy.

Sir James Mackenzie is perhaps the most conspicuous example of the doctor of medicine who has contributed notably to science. He was an investigator in physiology, cardiology and medicine. He had great difficulty in achieving the necessary scholastic diplomas to permit him to enter his chosen field. "I was not taught how to study," he wrote, "and had great difficulty in passing my examinations in my early years." Many years later, after he had achieved renown as a doctor of medicine and as an investigator, he wrote:

> There are two very distinct qualities of the human mind: memory, and the power of reasoning. The earliest to be developed is that of memorizing, and this can be cultivated with great ease. The power of reasoning is quite different, although, no doubt, memory takes a part. When we look at a great number of students, we discover that this power of memory is greatly developed in a few, and that all our educational methods are devoted to its cultivation. Examinations are specially contrived for the purpose of discriminating those with the best memories, and to them all the honors and prizes are given.
>
> The individuals who, on the contrary, possess more of the power of reasoning than their fellows, receive no consideration. There are minds which have a difficulty in remembering isolated facts, but if these facts are related in some consecutive manner, they can not only remember them but also appreciate their bearing on one another. But this type of mind is slow in acquiring knowledge, and in our present day methods of education less and less encouragement is given to this type of student. His peculiar powers are never developed, and their presence is never suspected.
>
> The outcome of the teaching of today is to hail the student with superior powers of memorizing as the brilliant student and the one with the great future. The consequence is that his path from the outset is made easy for him. Bursaries and scholarships fall to his share, and before he has acquired any experience, he is appointed to a teaching post. In the absence of any knowledge acquired from the results of his own observations, he is forced to teach that which he was himself taught, and, as he cannot discriminate between truth and superstition, he hands both on to his students. As years pass he comes to believe what he has taught is true and may even grow impervious to new ideas which are contrary to the beliefs he has been expounding.[8]

When Mackenzie wrote that statement Pasteur and Lister were waging a battle on behalf of the concept that living organisms cause disease. Is it not strange that a young physician with a character and mind like that of Mackenzie, launched into medical problems in the midst of such a revolution, should become himself somewhat of a revolutionist? The environment of the investigator does of course influence his research—but it is not the most significant factor.

In his autobiography, Ramon y Cajal,[9] greatly distinguished as an investigator of the nervous system, also listed some factors which he found important for those who devote themselves to scientific research:

> It is obvious that, with much boldness and presumption, I attributed to myself, *a priori*, some aptitude for scientific investigation. My only excuses are my youth and, especially, the psychological fact that without a certain lack of modesty nobody accomplishes anything important. Anyway, as I adventured in the objective examination of biological problems, my faith in myself increased, for it seemed to me that the presupposed qualities were confirmed *a posteriori*, among the most outstanding being patience bordering upon obstinacy in the mastering of histological methods, dexterity and skill in replacing expensive experimental arrangements with simple and improvised contrivances, indefatigable persistence and enthusiasm for the observation of facts, and finally, best of all, open-mindedness for sudden changes of opinion and correction of errors and preconceived ideas; all of these qualities are naturally of second rank, but adequate for the work undertaken. Besides, in this work, which my colleagues and friends considered wearisome, I found the most fascinating of amusements. When I was eagerly occupied at the eye piece, the winter evenings passed rapidly, without my missing theatres or social gatherings. I remember that once I spent twenty hours continuously at the microscope watching the movements of a sluggish leucocyte in its laborious efforts to escape from a blood capillary.

Here, it seems to me, we begin to recognize essential factors for scientific research. The worker must find interest, joy, excitement, pleasure, or emotional release in his task. Boredom in the course of investigation would be a fatal toxin.

If the point just made requires any laboring, let me cite in evidence a few paragraphs from the autobiography of Sigmund Freud.[10] After indicating that his religion prevented his acceptance in the University community, Freud continues:

> These first impressions at the University, however, had one consequence which was afterwards to prove important; for at an early age I was made familiar with the fate of being in the opposition and of being put under the ban of the "compact majority." The foundations were thus laid for a certain degree of independence of judgment.
>
> I was compelled, moreover, during my first years at the University, to make the discovery that the peculiarities and limitations of my gifts denied me all success in many of the departments of science into which my youthful eagerness had plunged me. Thus I learned the truth of Mephistopheles' warning:
>
> Vergebens, dass ihr ringsum wissenschaftlich schweift,
> Ein jeder lernt nur, was er lernen kann.
>
> At length, in Ernst Brücke's physiological laboratory, I found rest and satisfaction—and men, too, whom I could respect and take as my models: the great Brücke himself, and his assistants, Sigmund Exner and Ernst von Fleischl-Marxow. With the last of these, a brilliant man, I was privileged to be upon terms of friendship. Brücke gave me a problem to work out in the histology of the nervous system; I succeeded in solving it to his satisfaction and in carrying the work further on my own account.

Freud continues, pointing out that he was negligent in pursuing his medical studies, so that it was not until 1881 that he took his somewhat belated degree as Doctor of Medicine. Nevertheless, his first research project pointed him definitely toward further interest in the anatomy and physiology of the nervous system and ultimately to pathology and interest in nervous diseases.

Let us see how another great genius of medical research came into this field. In 1834, Claude Bernard in Lyons, France, had served as a practical pharmacist and had written a play and various other literary trifles. He took his play to Girardin at the Sorbonne, who recognized the literary talent but urged the young man to study medicine as a surer means of gaining a livelihood. In the fifth year of his studies, after serving as externe at the Hospitals he was appointed "interne" and Providence ruled that he should be allotted to Magendie, who was Professor of Medicine following Laennec.[11]

> Following the old tradition, it continued to be recognized that the duty of a Professor holding a chair in the College was not to give didactic lectures suitable to an ordinary student, but rather to use the post as an instrument of research, and to expound new ideas to those who were already advanced in their studies.
>
> * * *
>
> Magendie's contributions to physiological science were many and great; the exact and full proof which he brought forward of the truth which Charles Bell had divined rather than demonstrated, that the anterior and posterior roots of spinal nerves have essentially different functions, a truth which is the very foundation of the physi-

> ology of the nervous system, is enough by itself to mark him as a great physiologist; and he did much else besides. But all his lasting results, even when their fullest value is allotted to them, are incommensurate with his activity. If he did many experiments which bore adequate fruit, he did also many which were misleading and many which were useless. For his worship of the experimental method came very near to being idolatry. Repelled by the sterile discussions in which the vitalists and other doctrinaires of the day spent their intellectual activity, he was driven towards the other extreme, and arrived almost at the position of substituting experiment for thinking.

Thus the impelling force that drove Claude Bernard into research seems to have been a combination of chance or fate, which gave him opportunity, and early and prolonged contact with a great master, who imbued him with belief in the experimental method of acquiring knowledge and facts.

In Erwin F. Smith's introduction to Duclaux' life of Pasteur,[12] emphasis is placed again on such factors. Here is a quotation from Roux, who probably knew best the great founder of microbiology:

"Pasteur followed his idea as the magi their star. He was a priest; priest of the idea."

And Smith continues:

> In him, instinct or rather bold intuition, dominated reason. His disdain for traditional knowledge and philosophical speculations was scarcely concealed. Trusting only in experiments, he knew how to outstrip them and more than once went far beyond them.

Duclaux' famous biography[12] is subtitled "The History of a Mind." To love of the experiment must be added the quality of imagination.

> That which puts him outside of comparison is the fact that he loved great horizons, knew how to discover them and to make himself a part of them; that he saw at a distance and through the mists, more clearly than anyone else, the high summit he must attain to dominate the unknown and promised land. This was his rare gift and the secret of his power. But once seen he had wings to reach it. One might believe, considering the originality, the simplicity and the unexpected in his solutions, that they were spontaneous and in the nature of happy discoveries, accomplished without effort and by a sort of divination. Such surely was not the case with Pasteur's. If he was a discoverer it was first of all because he was a silent man and an obstinate one.

THE ELEMENT OF CHANCE

In the history of scientific investigation the element of chance, or accident, or "hunch" appears repeatedly. Sir Alexander Fleming—and no doubt some thousands of bacteriologists before him—had seen culture plates in which growth of a mold had prevented the growth of pathogenic bacteria. All had seen it—but one day Fleming noted it. Banting, an orthopedic surgeon, was reading in a medical library, probably just for the fun of it, when he chanced on a sentence that started him on the search that resulted in insulin. Cannon reports a study of "hunches" made by Platt and Baker among chemists. "Assistance from a scientific revelation or a hunch in the solution of an important problem was reported by 33 per cent; 50 per cent reported that they had such assistance occasionally; and only 17 per cent, never." The hunch arrives only after long study and meditation and only to a prepared mind. Professor Cannon credits to hunch his interpretation of the significance of bodily changes which occur in great emotional excitement, such as fear or rage. Such also was Otto Loewi's demonstration of a chemical agent liberated at the ends of nerves. Claude Bernard was led to the process called "internal secretion" by such a hunch.

Professor Cannon considers that unfavorable conditions toward developing a hunch are mental and physical fatigue, petty irritations, noise, worry over domestic or financial matters, states of depression, and strong emotions. Other unfavorable conditions listed include being driven to work under pressure and frequent interruptions or the feeling that interruption may occur at any moment "as in the demands of administrative duties." As far as I can determine, these are unfavorable conditions for any creative effort, including even the creation of human progeny. There is a great deal to keeping your mind on your work.

Hermann von Helmholtz, physician, physiologist, physicist, and philosopher of science, credits to luck his discovery of the ophthalmoscope.

> While preparing for a lecture I first hit upon the possibility of the ophthalmoscope, and then on the plan for measuring the velocity of the impulse in a nerve.
>
> The ophthalmoscope has become the most popu-

> lar, perhaps, of my scientific achievements, but I have already told the opthalmologists how luck played an incomparably greater part than my merit in this matter. I had to explain to my students the theory of ocular luminosity, which stemmed from Brücke. Actually, Brücke had missed the discovery of the ophthalmoscope by a hair's breadth. He had only neglected to ask himself the question: To which optical image do the rays returning from the luminous eye belong? Had he raised this question, he could have answered it just as quickly as I did, and the ophthalmoscope would have been discovered. I was considering the problem from different angles, in order to see how I could present it most simply to my audience, and while so engaged I hit upon the aforementioned question. As a result of my medical studies I was well acquainted with the difficulties confronting ophthalmologists in those conditions which at that time were lumped together under the term amaurosis. I immediately set about to construct the instrument out of spectacle lenses and cover glasses for microscopic preparations. At first it was still quite difficult to use, and without a firm theoretical conviction that it must work, I would perhaps not have persevered in my efforts. But after about eight days I had the great pleasure of being the first to see clearly a living human retina.[13]

Before this discussion of the hunch is abandoned, Cannon's view of the gains to be derived from serendipity also merits mention. The word "serendipity" was first used by Horace Walpole, who had read a fairy tale entitled "The Three Princes of Serendip." Serendip was the ancient name of Ceylon. "As their highnesses traveled," said Walpole, "they were always making discoveries, by accident or sagacity, of things which they were not in quest of." The term may be used then relative to ideas or facts reached during the progress of research when they were not actually the ends being sought. Columbus sailed from Spain searching for a short route to the Indies; he discovered a new world. Galvani noticed that some frogs' legs, hanging by a copper wire from an iron balustrade in his home in Bologna, twitched when they were swung by the wind and happened to touch the iron. This led to our acquaintance with electric phenomena, to "galvanism" and ultimately to the work of Volta, commemorated in the word "voltage." And so on to the telephone, the radio, and finally television.

The whole electrical industry seems to have been the outgrowth of a chance discovery made by a Danish physicist named Oersted "who happened to bring a wire, which was conducting a strong current, to a position above and parallel to a poised magnetic needle." Charles Richet discovered anaphylaxis or allergy when testing an extract of the tentacles of a sea anemone on laboratory animals to learn the toxic dose. When animals which had survived a large dose were given subsequently a much smaller dose they promptly died. The ancient Greeks reportedly discovered diabetes by finding that sandals stuck to the floor when men who were urinating stepped into the moist spot that remained following a careless performance. A laboratory assistant of von Mering and Minkowski noticed that swarms of flies gathered around the urine of dogs from which the pancreas had been removed. Pasteur said that "chance favors the prepared mind." Adventures in ideas are not likely to be offered those who encase themselves behind the wall of established knowledge or in a fixed pattern of living and thinking.

The instances here cited might be multiplied into hundreds; their value lies in the suggestions they give as to the nature of the mind that is likely to be most successful in research and investigation. The story of Paul Ehrlich, who failed as a medical student but achieved the Nobel prize for his discoveries in chemotherapy, should be well known. Wilhelm von Waldeyer, himself a student of Jacob Henle, both noted anatomists, writes of Ehrlich:

> Paul Ehrlich, a native of Strehlen in Silesia, went with me to Strassburg; he was then seventeen years of age and had already received his diploma from the Gymnasium. His father had recommended him to me, and I gladly received him in my house. He attended my lectures and my course in microscopy. Every student was assigned to a separate table, equipped with a microscope and the necessary materials. Four times a week for two successive hours, my assistants and I instructed the students; they could then work independently at their tables as long as they wanted from nine in the morning to six in the evening. During those hours when most of the students worked on their own, my assistant and I also gave instruction. Soon I noticed that Ehrlich worked for hours at his table, completely absorbed in his microscopic observations. Little by little his table became covered with stains of all colors. One day as I saw him I asked what he was doing to make his table glitter so with all the colors of the rainbow. Thereupon, this young student, who was only in his first semester, and who in this course was receiving his first academic

instruction, replied: "I am experimenting." With a friendly nod of approbation, I said to him: "Well, then, go ahead and experiment some more!" Upon inspecting the preparations that he had made without any special guidance, I soon saw that in Ehrlich I had an extraordinarily talented student.

A statistical study has been made of the characteristics of scientific investigators. Truman Lee Kelley,[14] professor of education and psychology at Stanford University, studied the mental traits of men of science and the bearing of recent scientific development upon problems of education and inheritance. He observed that a small amount of time and effort will at one time yield an enormous result, while in a second instance time and effort even a thousand times greater will yield but a fraction of the earlier return. Any philanthropic foundation would give all it had of resources to be guaranteed a discovery like the celestial mechanics of Galileo or Mendel's laws of heredity. The foundations like to point with pride, just as the rest of us do. The Rockefeller Foundation was ecstatic over the fact that it once gave about eighteen hundred dollars to Fleming before he discovered penicillin. However, as Professor Kelley wisely comments, "Probably no subsidy, however great, could stimulate even Euclid, Galileo, or Mendel to make second contributions of equal moment with their greatest achievements."

Professor Kelley, utilizing the questionnaire technic, which he himself characterizes as "the weakest device that has ever obtruded its prying and at times discourteous self into the respectable field of science," developed a composite picture of the mental traits of men of science. He believes that there are no exceptions to the following:

(*a*) The great man of science is industrious, shows great mental energy, and is persistent on the trail of a great discovery.

(*b*) He questions authority, at least in the one line of his greatest achievement.

(*c*) He is apt at drawing inferences, and is therefore ingenious in making hypotheses.

(*d*) His sense of logic is sound, so that he is perspicacious in making deductions.

(*e*) He is a keen observer of natural phenomena.

(*f*) He is dependent on observed facts.

(*g*) He is inventive in the matter of techniques.

(*h*) He is rich in the variety and number of hypotheses.

(*i*) He is not "inspirational" in his chosen field; i.e., his feet are always on the ground—his hypotheses are always amenable to some test of a factual or observational sort. But he is inspirational in the sense that a vision not the common property of his fellow-men urges him on.

The following are common, but not universal, traits of the scientific man:

(*j*) He lacks personal attachment to a hypothesis—he will slay his own mental offspring, or if he does not actually kill an erroneous hypothesis that he has given birth to, he will let it die from inattention.

(*k*) He is disputatious.

(*l*) In his person much transfer of training takes place, for he adopts to one field a device, method, or hypothesis drawn from another field.

(*m*) He is versatile in his interests, and even in his native abilities.

(*n*) He is tolerant.

The following are traits which are not uncommon:

(*o*) In his person erroneous transfer takes place, for he reasons by analogy without warrant.

(*p*) He has a good memory.

(*q*) He has a good mathematical ability, even though mathematics is not his major activity.

(*r*) He has excellent motor coordination and manipulative ability.

(*s*) He has a thorough knowledge of antecedent work.

(*t*) He has a deep religious feeling.

(*u*) He is generous.

(*v*) He is precocious in his development.

The following are traits which are not unknown in men of science:

(*w*) He is egotistical.

(*x*) He is modest.

(*y*) He has hobbies.

(*z*) He is not sociable.

(*aa*) He has ancestors of more than ordinary distinction.

These are the traits derived from his own life by Professor Walter B. Cannon solely by introspective analysis. These are the traits emphasized again and again by every competent writer who has given attention to the subject. From the results of his questionnaires, Professor Kelley notes that most scientists agree that certain tugs facilitate forward motion; namely (1) talents, (2) training and (3) facilities, whereas the hold-backs that slow down scientific progess include individual stupidity, prejudice, preconceptions and social taboos. Finally, rapid advance may be encouraged by adapting training to encourage a scientific type of thinking; providing better fa-

cilities for the conduct of scientific work; and causing society itself to lift further its taboos upon what men shall think and do. Actually the taboos are being lifted now so rapidly that some are already questioning the wisdom of complete release from inhibitions that were a part of the religious and moral training of the past.

President Conant, summarizing his consideration of the tactics and strategy of science, lists the ways in which new concepts evolve from experiments or observations and thus become fruitful of new experiments or observations. Such concepts may result from systematic experiments or observations; from a consideration of difficulties inherent in an old concept; from accidental discoveries which are followed up; from evolution through a series of successive approximations from older concepts; from elaboration of a limited working hypothesis; from the elaboration of an hypothesis or conjecture on a grand scale. Professor Conant adds also the definition of a concept and thus helps us to define more accurately the nature of research. A distinction must be made between a new concept and the "explanation of this concept." A scientific discovery must fit the times. A well-established concept need not be discarded if it is highly satisfactory to those who use it. Finally, advances in the practical arts are not the same as advances in science. The amassing of data, Conant emphasizes, does not constitute advance in science. Yet how often such mere accumulations have been labelled research and included in annual reports to amaze readers and encourage philanthropists and the directors of government bureaus!

THE FUTURE OF SCIENCE IN THE UNITED STATES AND THE NATIONAL SCIENCE FOUNDATION

Chancellor Robert Hutchins, speaking on the state of the university, remarked that one of the great new problems about scientific research is its cost. "The good old days, when a chemist could get along with a couple of glass bottles and a Bunsen burner in a back room, are apparently gone forever. Now the size of the equipment, its high rate of obsolescence, and the number of men required to operate it make research an enormously expensive undertaking." Industrial support has been most helpful, particularly since industries have learned to support basic as well as applied research. Hutchins notes also that the independence of an endowed university results largely from the fact that it has many sources of income. The university has welcomed government support of research, feeling that it does not endanger the independence of an endowed university unless such support is too large a proportion of the total expense of the institution. The proportion, he feels, is too large if the withdrawal of governmental support would endanger the essential activities of the university. "A university should be in a position to reject grants from the government when they invade the freedom of research, impose onerous terms upon it, or tend to force the university into fields that it does not want to enter." At this time, the report indicates, approximately 13 per cent of the income of the University of Chicago is derived from grants from governmental agencies. The university now has 99 contracts, covering 132 projects, with 16 agencies. The governmental agencies also are committed to the support of basic research. Few institutions now are unwilling to entertain the idea of government support. President Truman, in his message to the Congress on the State of the Nation, January 4, said:

> The value of our natural resources is constantly being increased by the progress of science. Research is finding new ways of using such natural assets as minerals, sea-water, and plant life. In the peaceful development of atomic energy, particularly, we stand on the threshold of new wonders. The first experimental machines for producing useful power from atomic energy are now under construction. We have made only the first beginnings in this field, but in the perspective of history they may loom larger than the first airplane, or even the first tools that started men on the road to civilization.
>
> To take full advantage of the increasing possibilities of nature, we must equip ourselves with increasing knowledge. Government has a responsibility to see that our country maintains its position in the advancement of science. As a step toward this end, the Congress should complete action on the measure to create a national science foundation.

Alan T. Waterman,[15] chief scientist, Office of Naval Research, in Washington, has indicated some of the reasons why scientists fear Federal support of research. The majority of

scientists would consider such support justified "provided the values inherent in the traditional environment of research, such as continuity, initiative and freedom of communication and publication, can be obtained."

In a statement to the Senate committee which held hearings on a federal program to promote scientific research, October 22, 1945, I pointed out that the number and diversity of measures that have been proposed are in themselves evidence of the difficulty of finding a formula that will accomplish the desirable objectives of such legislation without introducing factors harmful both to research and to our system of government. The factors to be avoided include bureaucratic domination of research, inhibition of investigations carried on under private initiative and the spending of funds to support education in the guise of encouraging research. Support by the government should leave the policy, personnel, methods and scope of research to the colleges, universities and research institutes themselves. Institutional and personal liberty in research must be fully safeguarded. The responsibility for such safeguards should be entrusted to men of scientific achievement, knowledge and leadership rather than to professional government administrators.

Professor Cannon felt that it certainly seemed reasonable that government should support research generously with the expectation that valuable results would be obtained, that the citizenry would be enriched, and the public welfare promoted. Nevertheless he feared political influences: "Any agency set up to administer a fund assigned by the government for grants-in-aid should, of course, be scrupulously fair in its decisions, acting in complete disregard of partisan, social, or racial considerations." Yet he feared particularly that entrance of the government into the field would diminish if not eliminate the funds coming from industries and the foundations. In France everyone counts on the government to support research and little or nothing comes from private sources. "Indeed," says Professor Cannon, "the French felt as little inclined to contribute private money to improve conditions in the universities as we might feel if asked for money to improve conditions in our postoffices."

Perhaps the greatest menace to science and the control of science by the state would be the establishment of a government by scientific experts who had no statesmanship. Thus J. B. S. Haldane quotes Russell's prediction of a world governed by science:

> In the scientific state there will be no war or real poverty, and a minimum of disease. The working class will be educated to be docile, industrious, punctual, thoughtless, and contented. They will probably largely be sterilized, so as to allow them unlimited frivolous love affairs. The ruling class will continually provide them with new amusements, and devise new methods of propaganda to increase their reverence for their governors.
>
> These latter, selected by psychological tests in early childhood and specially treated to secure the maximum of ability, will be trained in intelligence, self-command and leadership. But they will combine these with a fanatical loyalty to their class and its ideals, and a contempt for other human values. Individual love will be regarded as antisocial, and likely to lead to complexes.

SUMMARY

"Research," said Torald Sollman, "is a bird that sings only when it is free." Discovery requires the broadest possible liberty to search in as many places as possible, by as many competent scientists as possible, in any manner and by any means that they themselves consider possible.

Most basic among all the basic factors favoring scientific research is freedom—freedom for an inspired individual to pursue his will-of-the-wisp wherever chance or fortune may lead him. The inspired individuals appear, as if by chance; then educators and leaders in science recognize them and start them up the road to glory. Some find they are far ahead of their times and struggle desperately onward against the obstacles of doubt and derision—but they do not despair. Others, like Einstein and Michelson, ripen time for their concepts even when the vast majority of mankind have not the slightest idea what they are talking about. Harvey Cushing summarized it in a sentence of an address to the Massachusetts Medical Society at its 150th reunion in 1931. His paper was called "From Tallow Dip to Television." He said: "Opportunity, personality, position, chance, in addition to vision and the prepared mind—all have a hand."

There is no formula, no combination of circumstances, no system of organization guaranteed to produce the results desired. There are only investigators with characteristics somewhat common to their class, who appear rarely among thousands of neophytes in all the fields of science. We must recognize them early, give them facilities and opportunities, encourage them if they thrive on praise and taunt them if they do better on harrassment and stimulation. Apparently, no matter what we do, they will themselves go forward, even against the current, even to starvation and if need be to death, if within their souls is the true spirit of research.

RÉSUMÉ

"La recherche" a dit Torald Sollmann, "est un oiseau qui ne chante que lorsqu'il est libre." Les découvertes demandent des investigations aussi libres et aussi étendues que possible dans le plus grand nombre de champs variés par le plus de savants compétents possible, et par toutes les méthodes qu'ils considérent comme appropriées.

Parmi tous les facteurs fondamentaux qui favorisent les recherches scientifiques, le plus important, est la liberté—la liberté dont jouit celui qu'inspire la science à poursuivre son rêve où que le hasard ou la fortune puisse le conduire. Ils apparaissent, ces illuminés, ici et là, puis les éducateurs et les leaders de la science les reconnaissent et les conduisent vers les champs fertiles de la science et de la gloire. Quelques uns se trouvent en avance sur leur siècle et se débattent désespérement contre les obstacles offerts par le doute et la dérision—mais ils ne succombent pas. D'autres, tels Einstein et Michelson mûrissent leur ère par leurs conceptions même, si l'immense majorité de leurs contemporains sont incapables de les comprendre. Harvey Cushing l'a bien dit, dans son discours à la "Massachusetts Medical Society" lors de sa 150 réunion, en 1931. Son discours, intitulé, "de la chandelle de suie à la télévision" contient la phrase suivante:

> L'occasion, la personnalité, la position, la chance, en plus de la vision et de l'esprit aux aguetç: tout s'en mêle.

Aucune formule, aucun concours de circonstances, aucun système d'organisation ne peut garantir d'obtenir les résultats désirés. Ce sont des chercheurs dont les traits principaux se retrouvent fréquemment dans leur classe, qui apparaissent de temps à autre parmi les milliers de néophytes dans toutes les branches de la science. Nous devons les reconnaitre de bonne heure, leur fournir les opportunités et les facilités dont ils ont besoin, les encourager, s'ils se nourrissent d'hommages, les harceler s 'ils ne créent que sous le stimulus du dédain. Mais quoi que nous fassions, ils iront d'eux-même en avant, même contre le tumulte du courant, même en souffrant de la faim, et même jusqu'à la mort, si dans leur âme brille la flamme de la recherche.

RESUMEN

"La investigación" dijo Torald Sollmann, "es pájaro que solamente canta en libertad". El descubrimiento requiere la máxima libertad posible, para investigar en el mayor número de lugares posibles, por el máximo número de hombres de ciencia competentes que sea posible, y del modo y por los medios que ellos consideren posibles.

El factor básico más importante de todos es la libertad para que un individuo inspirado siga la huella de sus inspiraciones, donde quiera que el azar y la suerte puedan llevarle. Los seres inspirados aparecen como por azar, pero después los educadores y los abanderados de la ciencia los reconocen, y los encaminan hacia la ruta que asciende a la gloria. Algunos de ellos están muy por delante de su época y luchan desesperadamente para ir adelante contra los obstáculos de la duda y el escarnio por no desesperar. Otros como Einstein y Michelson llegan a madurar sus conceptos, incluso cuando la mayoría de la Humanidad no tiene idea de las cosas de que allos están hablando. Harvey Cushing resumió este punto de vista en una frase de un discurso en la Sociedad Médica de Massachusetts en su 150 reunión celebrada en 1931, titulado "De la vela de sebo a la televisión", en el que dijo:

> "La oportunidad, personalidad, posición y azar, además de la visión (intellectual) y la preparación mental . . . todos son factores participantes."

No existe fórmula, combinación de circunstancias ni método de organización que esté garantizado para producir los resultados deseados. Solamente existen que investigadores

con características en cierto modo comunes a su clase, que aparecen regularmente entre miles de neófitos en todos los campos scientíficos. Debemos reconocerlos precozmente, darles facilidades y oportunidades, alentarlos si son del tipo que madra con el elogio y fustigarles si es que trabajan mejor cuando se les somete al apremio o al estímulo. Al parecer, no importa lo que hagamos, esos hombres marchan adelante e incluso contra la corriente, llegando a sufrir depauperación y si fuera preciso hasta la muerte, si es que dentro de sus almas existe el verdadero espíritu de la investigación.

RIASSUNTO

"La ricerca" ha detto Torald Sollmann "e' un uccello che canta solamente quando e' libero." Le scoperte richiedono la piu' ampia liberta' di azione nel maggior numero di localita', dal maggior numero di scenziati, nella maniera e con i mezzi che essi ritengono piu' idonei.

La base fondamentale per ispirare, per favorire la ricerca scientifica e' la liberta': liberta' per ogni individuo che trova un'ispirazione di seguire il suo ideale, qualunque sia l'esito che lo attende. Individui dotati di un'ispirazione sorgono quasi per incanto: la loro ascesa alla gloria viene poi aiutata dai maestri e dagli educatori. Alcuni di questri iniziatori appaiono spostati nel tempo, nel senso che precorono gli eventi: essi debbono lottare contro dubbi e derisioni, ma non disperano mai. Altri, come Einstein e Michelson, maturano i loro concetti anche allorquando la grande maggioranza dell 'umanita' non ha la minima idea di cio' che scrivono o dicono.

Harvey Cushing, nel parlare alla Societa' Medica del Massachusetts durante la sua 150ª-riunione nel 1931, ha riassunto in una frase gli elementi che contribuiscono al successo: "Opportunita', personalita'posizione, combinazione, preparazione e previsione; tutti questi elementi recano il loro contributo."

Non esiste una formula, una combinazione di circostanze, un sistema di organizzazione, che assicurino i risultati desiderati. Esistono solo taluni ricercatori, aventi caratteristiche proprie alla loro classe, che si selezionano da migliaia di neofiti in tutti i campi della scienza. Dobbiamo riconoscerli in tempo: dare loro i mezzi e le opportunita'; incoraggiarli se vengono stimolati dalle lodi, criticarli se migliorano con un giudizio piu' severo. Qualsiasi cosa facciamo per loro, essi andranno avanti da se', anche contro corrente, anche verso la fame—o se necessario—verso la morte, se nella loro anima esiste il vero spirito della ricerca.

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In the fields of observation, chance favors only the prepared mind.—*Pasteur*

Dangers and Disappointments of Biliary Surgery

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LONDON

THIS paper must of necessity be brief. It is an epitome of some dangers and disappointments that dog the steps of surgeons who engage in operations on the biliary passages, and it has been aptly stated that this region is "one which is approached with bated breath and departed from with a sigh of relief!"

Difficulties and Dangers.—1. Hemorrhage: Apart from unavoidable and perhaps tiresome bleeding from division of small veins during exposure of the ducts, hemorrhage should not occur. The cystic artery is the only dangerous vessel that concerns the surgeon, and theoretically it should be possible to expose and ligate this artery without difficulty. However, accidents occasionally occur. The vessel may retract through the teeth of faulty forceps, or the ligature may slip, especially if catgut is used; therefore thread or silk, either of which has a much better frictional grip, is preferable. In the event of arterial hemorrhage, blind groping with hemostatic forceps is an instinctive reaction but one to be deplored, since there is danger that a bile duct, especially the right hepatic duct, may be included. The correct procedure is to control the bleeding by means of a swab on a holder and to insert the left forefinger through the foramen of Winslow; pressure with the thumb then compresses the hepatic artery. Blood is then mopped away, and gentle relaxation of pressure will reveal the exact site of the bleeding. If necessary, this maneuver can be repeated until the actual vessel is clearly seen, when it may be seized and ligated. As a last resort, if local conditions render ligation impossible, the hemostat must be left *in situ* and the wound closed around the instrument, which is removed four days later.

2. Injury to Ducts: Even if one follows the golden rule that ducts must be clearly exposed, accidents occasionally occur, especially if the ducts deviate anatomically from what is considered normal. In this connection it is interesting to record that Flint[1] studied the anatomic pictures of the biliary ducts in 200 cases, and in only 69 did they conform to the usual textbook description. Should one of the hepatic ducts be divided, immediate end-to-end suture must be attempted, and the junction is supported by a T-tube introduced *below* the suture line. If the tube is inserted through the anastomosis the formation of a subsequent stricture is encouraged.

Abnormal ducts cause trouble even to the most experienced surgeon, and two of these deserve special mention.

(*a*) A cholecystohepatic duct occasionally passes from the liver into the back of the gallbladder (Fig. 1). This should be recognized by an observant surgeon who is aware of the possibility. Ligation is the ideal procedure; otherwise the duct is ruptured when the gallbladder is separated from its bed. This can be recognized by drops of bile continually escaping at one point on the raw surface. Firm application of the diathermy button usually seals off the duct. If the condition is unrecognized, bile will be discharged and form a subphrenic collection that requires drainage, but after a few days or weeks the discharge ceases. Neuhof and Bloomfield[2] described 2 cases in which the duct measured about 2 mm. in diameter. In 1 case it was unrecognized, and a fistula resulted which closed in forty-five days; in the other the duct was recognized at operation and closed with a purse-string suture.

(*b*) A more serious condition confronts the surgeon when the right hepatic duct enters the gallbladder (Fig. 2). After ligation of the cystic duct and artery this abnormal duct is in imminent danger when the gallbladder is separated from the liver. If the duct is recognized before division the easiest procedure is to perform a cholecystoduodenostomy; otherwise the severed duct must be implanted into the left hepatic or the common bile duct.

Disappointments.—I do not propose to discuss the disappointments that follow inadequate or inefficient surgical management, such as damage to normal ducts, errors of diagnosis,

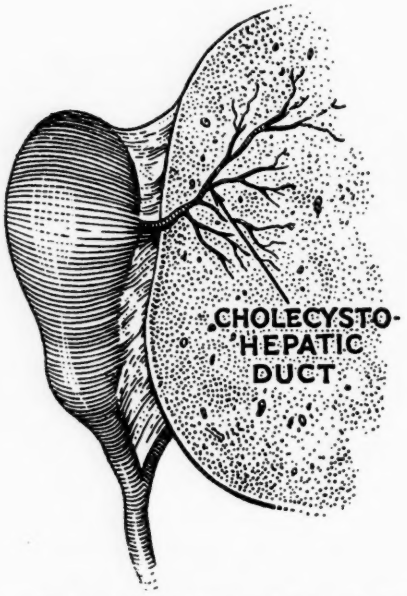

Fig. 1.—Cholecystohepatic duct passing from liver into back of gallbladder.

(e.g., in cases of coronary disease) or omission to remove the appendix. I am limiting my remarks to some of the disappointments that occur even after recognized and accepted methods have been adopted.

1. Overlooked Stone: After cholecystectomy for gallstones, about 1 per cent of patients present themselves with a further stone or stones in the extrahepatic ducts. Symptoms recur, and the question arises whether the stone was overlooked at the operation or subsequently developed in the duct. The surgeon favors the latter theory! However, a cholangiogram taken during the operation is a valuable safeguard against overlooking a stone. A roentgen film of the biliary passages taken during operation is of the greatest value, as it may reveal an obstruction or an abnormality not discernible by sight or touch. Conversely, if in a doubtful case the ducts are shown to be normal, unnecessary exploration is obviated. The technic is simple and the time consumed is negligible.[3]

When the patient returns with a second stone, a further operation must be performed on a sufferer who has lost some of his previous enthusiasm.

2. Chronic Pancreatitis: Infection spreads from the biliary tract along the pancreatic ducts to the acini. Pancreatic secretion is diminished, and flatulent dyspepsia follows.[4] Unless this is remedied, the patient complains of symptoms like those from which he suffered prior to cholecystectomy, and he is naturally disappointed. The remedy lies in curtailing the intake of fats and prescribing some pancreatic preparation for three months or so.

After a variable period the symptoms alleviate or disappear, either because the pancreatic infection subsides or because the intestinal glands adapt themselves, as presumably occurs after removal of the head of the pancreas for carcinoma.

3. Sphincteric Spasm: It has been shown experimentally that the sphincter of Oddi relaxes after removal of the gallbladder. However, if infection of the biliary passages persists after operation, spasm of the sphincter may be maintained. This type of biliary dyskinesia is characterized by recurrent attacks of pain that simulate biliary colic.[5] Morphia and

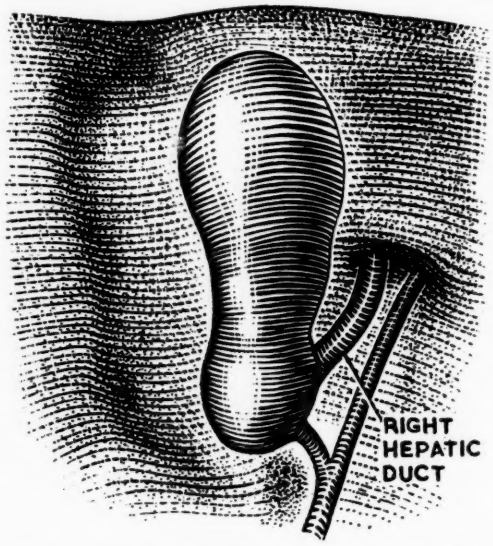

Fig. 2.—Abnormal right hepatic duct entering gallbladder.

its derivatives are contraindicated, as they cause further spasm. Antispasmodics, such as amyl nitrate for an emergency, or pethidine (an atropine derivative) for more prolonged use, relieve the symptoms. Cholagogues, such as saline aperients and dehydrocholin, diminish the viscosity of the bile and are valuable adjuvants. If symptoms persist, duodenotomy is sometimes advisable. This permits division of the sphincter, which may be not only spastic but fibrotic.

A further cause of reflex sphincteric spasm is the formation of a calculus in the stump of the cystic duct, which should have been ligated ¼ inch (0.6 cm.) from the common duct. Symptoms develop some years after cholecystectomy, and if the patient is incapacitated exploration is necessary; this possibility should be borne in mind. Peterson[6] collected 42 cases, in some of which the cystic stump was as large as a normal gallbladder. The stump is usually burned in adhesions, and may be discovered only by opening the common duct and passing a probe into the cystic duct.

4. Premalignant Lesions of the Ampulla: In a recent paper, Cattell and Pyrtek[8] reported cases in which symptoms persisted after cholecystectomy and were found at subsequent operation to be due to an adenoma, either simple or undergoing malignant change, of the ampulla. This emphasizes the desirability of cholangiographic study during operation, as a filling defect or obstruction of the lower end of the common duct would encourage the surgeon to explore further, either by mobilizing the duodenum or by performing a duodenotomy.

It is interesting to note that innocent neoplasms in this area are occasionally an incidental discovery during routine autopsies.

SUMMARY

No urologist would deem his responsibility discharged if he merely removed a stone from a bladder. Causes, complications and subsequent effects all require consideration. The biliary apparatus and its handmaiden, the pancreas, are an even more perplexing, and a much less understood, combination of complicated structures.

A check-up on the end results of cholecystectomy shows that about 15 per cent of the patients are disappointed (Sanders,[8] Saint[9]). This is a high figure, and it is only by careful consideration of operative technic and thoughtful after-treatment that this figure can be reduced to negligible proportions, as it should be.

RÉSUMÉ

Nul urologiste consciencieux ne considère son devoir rempli lorsqu'il a simplement extrait un calcul de la vessie. Sa cause, les complications possibles et autres données exigent qu'il y concentre son interêt. Le système biliaire et son frère cadet, le pancréas, sont encore plus complexes et bien moins compris dans leur ensemble de structure compliquée.

L'étude des résultats finaux de cholécystectomie démontre qu'environ 15% des malades en furent désappointés (Sanders, Saint). C'est là un chiffre élevé et ce n'est qu'après une évaluation approfondie des techniques chirurgicales et d'une thérapeutique post-opératoire bien pesée que ce taux peut être réduit à de plus justes, et infimes, proportions.

RESUMEN

Ningún urólogo puede considerar que ha cumplido con su responsabilidad simplemente extirpando un cálculo de la vejiga. Las causas, complicaciones y efectos subsiguientes requieren también su atención. El aparato biliar y su compañero el páncreas son una combinación de estructuras complejas más complicadas y menos entendidas.

Una revisión de los resultados finales de la colecistectomía demuestra que el 15 por ciento de los pacientes no quedan curados. (Sanders,[8] Saint[9]). Esta es una cifra elevada y solo mediante la consideración minuciosa de la técnica operatoria y un tratamiento postoperatorio bien meditado, podría reducirse esta cifra a las proporciones insignificantes en que debiera encontrarse.

RIASSUNTO

L'apparato biliare ed il pancreas formano una combinazione fisiopatologica che non e' ancora bene compresa e che offre adito a molte incognite. Un controllo dei risultati a distanza della colecistectomia dimostra che nel 15% dei casi i pazienti non sono soddisfatti. Questa percentuale e' troppo elevata. Potrebe e dov-

rebe essere ridotta (come e' avvenuto pez i calcoli vescicali) se la tecnica operativa fosse sempre perfetta e se le cure pre- e postoperative venissero scrupolosamente seguite.

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A Simpler and Safer Proctosigmoidectomy

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THE proctosigmoidectomy of Mr. W. Ernest Miles of London, published in 1914,[1] marked an epochal advance in the treatment of malignant disease of the terminal portion of the colon. It remains a very popular operation, although evidence has accumulated during recent years that it has unnecessary and objectionable features.

Unnecessary for most patients with cancer of the bowel is the removal of the anus and surrounding perineum, areas which in 97 per cent of cases are and remain free from malignant invasion.[2] This perineal phase of the operation is also objectionable as adding to the magnitude of the operation and greatly delaying recovery.

Objectionable also is the retention of mesentery and peritoneum to an "inch" of its bowel attachment in order to peritonealize the denuded areas and to form a pelvic diaphragm, for this makes the Miles operation less radical and invites recurrence. Such recurrences in peritoneum and fascia propria I have found rather frequently in attempting to transplant objectionable colostomies from the Miles operation to the perineum. It seems probable that the rather low five-year survival rates—between 42 and 55 per cent—reported by well known surgeons, such as Gabriel, Dukes, Cattell, Lahey and T. Jones, may be due to this cause. Otherwise it seems difficult to explain why, after the "pull-through" type of operation,[3] in which the mesentery and pelvic peritoneum are widely excised but the anus retained, the five-year survival rate has been from 65.5 to 77.3 per cent.

Since methods of computing statistics vary, an explanation is desirable. In my personal series, with an operability of 97 per cent, 150 patients survived for five or more years the pull-through type of operation for carcinoma of rectum or sigmoid. Of these, 22 with metastatic carcinoma of the liver found at operation and 13 who later died of nonmalignant causes have been deleted, leaving 115 patients, including all (18) who could not be traced after operation, as well as those (55) who had malignant extension to lymph nodes, small intestine, uterus, prostate or vagina. Of the 115 patients 75, or 65.5 per cent, have lived five or more years since the operation. If untraced patients are omitted the percentage is 77.3.

I know of no death that could be attributed to the wide denudation of pelvic peritoneum, and in a few instances reoperation has demonstrated surprising reperitonealization with relatively few adhesions. Experimentally, catgut and other irritating suture materials lead to postoperative adhesions that may be fully as dense as those following deperitonealization. In other words, the surgeon who peritonealizes with catgut sutures may be confronted with secondary adhesions as dense as would have occurred had the area been denuded of peritoneum.

With the evidence that cancer of the bowel situated 6 cm. or more above the perineum has little tendency to spread downward, and that a wide removal of the peritoneum and fascia propria about and above the cancer is necessary, I have used, in selected cases, a simplified abdominal proctosigmoidectomy that is well adapted for surgeons who do not object to leaving the patient with a colostomy. Through a midline incision extending upward from the pubis or a left oblique incision along the lateral border of the left rectus muscle, the abdomen is opened and explored for metastases or other complications. The left peritoneal leaflet of the rectum and sigmoid is divided wide of the bowel. The left spermatic or ovarian veins are separated from the peritoneum and retracted to the left, as is also the slightly deeper left ureter. The hand is then slid under the rectum and sigmoid, which are

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widely separated from the bifurcation of the aorta, the iliac vessels, the lower vertebrae and the sacrum to the base of the coccyx. As the right peritoneal leaflet is elevated by the underlying hand, the right ureter is recognized running along the brim of the true pelvis. Medial to and parallel with the right ureter, the thin, semitransparent peritoneum is divided freely. The hand is withdrawn from under the sigmoid loop and the medial edge of the right-sided mesenteric incision is elevated on the finger, which catches also the underlying thick cord of superior hemorrhoidal vessels and lymphatics. The upper portion of this cord is divided between clamps below the first sigmoid artery or at a point well above any enlarged lymphatic nodes, and is transfixed and doubly ligated. Below and parallel with the first sigmoid artery, the mesentery is divided from its peritoneal margin to the bowel, with ligation of any open blood vessels. If necessary to obtain sufficient free bowel to reach through the anterior abdominal wall, the lower part of the descending colon may be liberated after dividing its left lateral peritoneal reflection parallel with and 1 or 2 cm. from the bowel. The lateral peritoneal incisions are extended downward wide of the bowel and united in front of the base of the bladder or vagina, with liberation of the rectum and division of the medial and inferior hemorrhoidal vessels at the sides of the pelvis. Usually these vessels are small and may not require ligation. Care should be taken to avoid the ureters by their early liberation and lateral displacement. Anteriorly, with the aid of deep retractors, the bowel is separated from the bladder and seminal vesicles or from the vagina. With the rectum elevated, two right-angled clamps are applied across it at least 4 cm. below the cancer, and the bowel between the clamps divided by cautery; or by a knife followed by application of tincture of iodine to the cut surfaces. The clamped upper segment is withdrawn and wrapped in a towel. The next important step is provision for adequate drainage.

Drainage.—Drainage is an important part of operations in which the rectum and sigmoid are resected. There is considerable exudation of blood and serum from denuded areas and irritated serosal surfaces. With bacterial contamination or leakage along lines of anastomosis, an easy convalescence or a fatality may hinge upon the drainage. Anterior drains, especially of adhesion-provoking material such as gauze or rubber, lying between intestinal coils not infrequently lead to intestinal obstruction. Drains with adequate vents lying entirely behind or below the mass of intestinal coils provide good drainage with the fewest complications. From a considerable experience with bulky gauze drains through the vaginal vault, after operations for uterine and ovarian tumors, pelvic infections and ectopic pregnancy, as well as for rectal resections with associated removal of portions of the female pelvic organs, I recall no serious complications resulting from use of these lower drains.

Would the anal canal serve as well as the vagina for drainage after rectal resection? From an emergency trial in a patient from whose low rectal anastomosis a heavy fecal leakage had developed, it was decided that the anal canal serves even better for drainage than the vagina. In this case the bowel was clamped just above and just below the anastomosis, which was pulled apart. The edge of the lower segment of rectum was steadied by one or two hemostatic forceps, the clamp removed and the end of a folded iodoform gauze tape 5 cm. wide and 1 m. long was pushed down through the terminal segment of bowel and anus. The anal canal was not cleansed from above, but a sufficient length of tape was introduced to push out any fecal material as well as to wipe off the mucous surfaces. The tape was made of a piece of gauze 1 m. long and 20 cm. wide, folded with the selvedge edges inside. The residual tape was folded smoothly upward and downward so as to cover completely the open lower end of the rectum and also all contaminated or denuded surfaces about the pelvic floor. It was so folded that the underlying layers would be the first withdrawn from the anus without disturbing the anterior folds, which in the early postoperative period may be adherent to overlying bowel or omentum. Gauze pads, used to keep the small bowel from the upper part of the pelvis during the operation, were next removed and the omentum pulled down anteriorly over the intestinal coils. The abdominal

incision was then closed about the protruding sigmoid, which formed the colostomy.

In less urgent cases an additional incision may be made through the abdominal wall at a point selected for the colostomy opening. Through this opening a clamp is passed from the outside to grasp the liberated sigmoid well above any area of malignancy. Just distal to this a second clamp is applied, and with surrounding protecting wet pads the bowel is divided between the clamps by a cautery. The malignant segment is discarded, while the proximal end, iodized and with a protective cover, is pulled through the colostomy opening in the anterior abdominal wall by its attached clamp. The rest of the abdominal incision is then closed, preferably with layer sutures of interrupted or continuous single or multistrand stainless steel wire.

The protruding bowel should be divided 5 cm. or more above the abdominal wall and a tube tied in. A right-angled glass tube 1 to 2.5 cm. in diameter, with hollow bulbous ends, is preferred. A ligature about the tube and bowel arrests bleeding, while a thin rubber Penrose drain, slipped over the other end of the tube and tied, serves to conduct any intestinal drainage into a rubber bag or glove outside the dressings. The protruding sigmoid should stand up at right angles to the abdominal wall and should be protected and supported by a cuff of soft gauze. Necrotic openings in the bowel close to the skin are often caused by the pressure of carelessly arranged dressings, adhesive plaster or bags and may give the patient much discomfort from leakage and erosion of the skin.

No other drainage is needed, and the gauze through the anus has drained satisfactorily, with little or no irritation or tenesmus. Probably others have used peritoneal drains through the anal sphincters before, but I recall no published case. I have used the method not only when, after low end-to-end anastomosis, free leakage of intestinal contents into the abdomen has occurred but also when the pull-through type of proctosigmoidectomy has been followed by ascending necrosis of the bowel and leakage into the abdomen of intestinal gas or feces. Likewise, it has made possible a rapid termination of a low resection of bowel when hemorrhage, leakage, abscess or other serious contamination or complication has occurred. For example, a severe and inaccessible hemorrhage, as from the obturator vein, has been arrested by a gauze pack which later it is desired to remove with the least disturbance of the wound or the abdominal contents; these conditions are met by the facility with which the gauze may be withdrawn through the anus.

The operation can be used with increased safety and shorter convalescence instead of the conventional abdominoperineal or perineoabdominal resections, when the lower 6 cm. of rectum is free from disease, and it carries the possibility of a later anal anastomosis and abolition of the colostomy. The uniform rapid and comfortable convalescence after this operation has convinced me that it is also a safer method for removing a septic or perforated section of rectum, e.g., in cases of malignant disease or diverticulitis. It may be selected as the safest type of operation for a gunshot or other wound of the rectum or when there is a serious pelvic infection necessitating colostomy and free pelvic drainage. Likewise, if there has been an associated injury with insecure or questionable closure of the ureter, bladder or small intestine, this operation provides excellent dependent drainage while stimulating the formation of limiting adhesions.

It is simpler and safer than the Hartmann operation, in which there is an anterior resection of the rectum and sigmoid, the distal end of the rectum being inverted and closed by suture, while the proximal segment is brought out through the anterior abdominal wall for a colostomy. The inversion of the edges of bowel by suture with dependable water- and gas-tight closure of the distal end of the bowel, particularly if in the depths of the pelvis, may be the very difficult part of the Hartmann operation, and I now know it to be both unnecessary and undesirable. For the surgeon who in any case will leave the patient with an abdominal colostomy, I feel sure the method is of advantage provided the malignant growth has not involved pelvic structures below the level for adequate extirpation through an abdominal incision.

The procedure makes possible the rapid termination of a lower bowel resection, as in

the case of hemorrhage, fecal soiling or shock. The operator of limited experience in intestinal surgery should be able to reduce his mortality rate by this simplified procedure, and if the patient is dissatisfied with the colostomy, it may perhaps, in more experienced hands, later be eliminated by an end-to-end anastomosis or by a pull-through type of operation in which even a part of the transverse colon may be pulled through the anal ring. Likewise, surgeons who have preferred the Miles operation may find this procedure of advantage for growths that are sufficiently high in the rectum. However, many patients, to avoid colostomy, will accept the greater risk of resection with end-to-end anastomosis or of the pull-through operation.

In postoperative treatment, care should be taken not to disturb the anal gauze drain during the first four days after operation, except gently to straighten out any kinks or folds where it passes through the anal canal. The gauze should not be cut off close to the perineum, lest it may retract and be difficult to find. To reduce any tendency to ascending peritoneal contamination, which seems to be slight, I have used gauze pads, the one next to the perineum being coated with a layer of 2 per cent yellow oxide of mercury ointment.

The gauze drain is partly withdrawn on the fourth or fifth postoperative day, provided it comes away without resistance. Additional loose segments of gauze are then removed daily until all have been removed—usually about the seventh day. Withdrawal of the gauze should not be painful, and assistants should be warned against early removal of the drain. As a rule, in uncomplicated cases the patient is in condition to leave the hospital between the eighth and the tenth postoperative day.

SUMMARY

A simplified method of radical proctosigmoidectomy with colostomy for rectal carcinoma, diverticulitis and other inflammatory lesions or traumatic injuries of the lower bowel, with anal drainage, is described.

The unusual but extremely important part of the operation is the use of the anus and the terminal segment of the bowel for comfortable and effective dependent gauze drainage of the abdominal cavity.

As the operation retains the anus and sphincters, the colostomy may be eliminated later by an end-to-end or a pull-through type of anastomosis.

RÉSUMÉ

L'auteur décrit une méthode simplifiée de proctosigmoïdectomie radicale avec colostomie pour les cas de carcinomes rectaux, les diverticulites et autres lésions inflammatoires ou traumatiques de la partie inférieure du gros intestin. Cette méthode emploie le drainage anal.

La partie originale, mais extrêmement importante de cette opération consiste à utiliser l'anus et la partie terminale du gros intestin pour le drainage à la gaze dans la partie déclive de l'abdomen, qui est à la fois confortable et efficiente.

Comme cette opération conserve l'anus et les sphincters, la colostomie peut être supprimée plus tard par l'anastomose bout-à-bout ou l'anastomose à traction.

RESUMEN

Se describe un método simplificado de proctosigmoidectomía con colostomía para tratar un carcinoma rectal, diverticulitis y otras lesiones inflamatorias o lesiones traumáticas del colon con drenaje anal.

La parte poco frecuente pero extremadamente importante de la intervención es el empleo del ano y del segmento terminal del intestino para un drenaje cómodo y eficaz de la cavidad abdominal.

Como la operación conserva el ano y los esfínteres puede eliminarse después la colostomía por un tipo de anastomosis términoterminal o de anastomosis cruzada.

RIASSUNTO

Illustra un metodo semplificato di proctosigmoidectomia radicale con colostomia per cancro rettale, diverticolite ed altre lesioni infiammatorie o traumatiche del colon e del sigma. La parte piu' insolita ma piu' importante dell 'operazione consiste nell'uso dell'ano e della porzione terminale dell'intestino quale drenaggio comodo, ma nello stesso tempo sicuro della cavita' addominale.

Dato che l'operazione conserva l'ano e gli sfinteri, la colostomia puo' essere eliminata in

seguito mediante un'anastomosi termino-terminale.

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Language in Levitation

The apothecary's *scruple* was originally the *scrupulus*, a pebble of insignificant weight and size. Your laboratory *funnel* has its name from the Latin *fundere*, to pour, and the *refund* you may get on your income tax is literally a *pouring back*. The *razor* you use every morning is twin brother to the *abrasive* you described in that last surgical article; both stem from the verb *radere*, to *scratch out*, to *erase*. Your instrument case was once known as a *tweeze;* hence *tweezers*, one of the instruments therein contained. The parent word is the French *etui*, a small case.

Influenza, an Italian form, is a memento of the ancient supersition that ascribed epidemic disease to the *influence* of the stars. *Cancer* and *chancellor* have a common origin. No patient is *decrepit* until he *creaks* with age.

The salary you pay your secretary is her *salt*, and we hope she does not spend it all on *sausage* (which, oddly enough, is its cousin once removed) but prudently salts it away. If her youthful *caprices* annoy you, you may without loss of dignity refer to her as a troublesome kid, for to be capricious is to caper like a goat. Nevertheless, if you speak to her with *sarcasm*, she may justly call you a *sarcophagus*, which was a flesh-devourer before it became a coffin (hence "biting sarcasm," which is actually a redundancy).

Finally, if these linguistic vagaries make you *dismal*, it must be truly one of your bad days (*dies mali*). Muse bitterly on it if you will, but it is only fair to tell you that when you *muse* you employ your *muzzle*, as a dog does, to nose out discoveries.

Periarterial Sympathectomy to Improve Vascularization of Lower Extremity

Report of a Case

PROF. DR. ARNOLD JIRASEK, F.I.C.S. (Hon.)
First President, International College of Surgeons
PRAGUE

IN CASES of arterial thrombosis and obliteration Leriche suggested and performed resection of these parts, achieving correction of the vasoconstriction produced by the arterial changes.

In a report to the London congress (1947) he discussed the clinical and experimental observations and summarized: "Arteriectomy limits the reflectory mechanism of vasoconstriction to the local collateral circulation, where it produces active dilation. This observation proves that there is in the arterial wall a reflectory mechanism of vasoconstriction of collaterals, i.e., of reflectory arterioarterial and also of arteriovenous elements."

Leriche also reported 2 convincing cases. In the first, a 32-year-old patient complained of intensive abdominal pain followed by sudden signs of circulatory disturbances of the right lower extremity (tingling, edema, cyanosis and ulcers of the fourth digit). At operation the appendix was seen to be fixed to the iliac artery. After its removal the symptoms disappeared. In the second case intermittent limping, cyanosis and cooling of the extremity occurred after a bullet wound in the gluteal region. At operation a neuroma of the interrupted saphenus nerve adherent to the femoral artery was observed. After its removal normal conditions reappeared. Both the results of resection of thrombosed arteries and the results of removal of the cause of irritation in the arterial wall justify the concept of Leriche.

An interesting contribution to this concept is afforded by my experience in a certain case. There was an unexpected course during periarterial sympathectomy of the right femoral artery, which was performed because of symptoms of endarteritis due to frozen lower extremities.

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The patient was a 35-year-old soldier whose legs were "frozen" after long standing in snow at the end of January 1945. He was treated for a short period only and returned to his military duties. Shortly afterward he began to complain of considerable and sometimes unbearable pain in the digits of both extremities, especially of the left second toe. He was admitted to the clinic on July 5, 1945.

The patient was of medium height, muscular and in good health. The temperature was 36.3 C., the pulse rate 75, the blood pressure 150 systolic and 110 diastolic. The digits of both lower extremities were cool and cyanotic and their skin was scaly. The pulse was impalpable in both dorsal arteries. Roentgen examination showed that the soft parts of the terminal phalanx of the left second digit were enlarged. The bones showed no pathologic change. Oscillations were noted as follows:

	Right leg	Left leg
Below the knee (maximum)	180/4½-160/4½	180-160/4
At the ankle	130/3	140/3

The following plan was suggested: (1) infiltration of the arteries with 1 per cent novocain; (2) infiltration of the lumbar sympathetics; and (3) periarterial sympathectomy. The first two treatments were without success; therefore periarterial sympathectomy of the left femoral artery was performed on July 10. The condition improved. On August 4 the same operation was performed on the right side (Prof. Jirásek). The artery was of normal size and embedded in tough adhesions, from which it was easily freed. The procedure was then carried through. During the final maneuvers the artery started to bleed slightly from the point where it was fixed with a forceps. If one tries to compress this point with an artery forceps, the small opening increases to a length of 1 cm. The arterial wall is apparently affected, as it ruptures with each compression. No further compression or suturing, therefore, can be contemplated. Because of bleeding of the peripheral end, the decision to perform an emergency ligature of the femoral artery with resection of the bruised tissue (about 3 cm.) is made easier. The extremity, for half an hour, was cooler; later the condition improved. The

pulse reappeared at the inner side of the ankle. Three hours after operation, infiltration of the right sympathetic was performed, and this was continued during the whole week. Two later examinations of the oscillations have shown that these are almost absent. However, during walking there are no symptoms referable to the extremities and no pain. The patient is completely satisfied with the result achieved. The pain and the feeling of coolness have disappeared.

It is difficult to explain this case completely. The result shows that resection of the patent artery had a good influence on the pain and the feeling of coolness in the legs, although vascularization of the extremity should have been smaller quantitatively, considering the interruption of the main blood supply. It is necessary to quote Leriche, who, basing his opinion on the experiments of Luigi Porta (1846) states in 1947: "Isolated arterial obliteration, i.e., without added vasomotor symptoms, is always well tolerated if the collateral branches of the obliterated artery are patent and if the arterial pressure is sufficient." In the present case the arterial pressure was sufficient, but probably the collateral circulation was insufficiently functioning. The adhesions observed at operation suggested irritation of the periarterial nervous pathways. The previously mentioned condition put forward by Leriche was therefore not fulfilled. Freeing and interruption of the periarterial femoral vasomotor pathways which were still irritated by the clearly demonstrated periarterial adhesions affected favorably the collateral circulation, which was probably constricted because of this irritation. I have made similar observations repeatedly in other cases. The improvement is not indicated by the different oscillographic readings taken before and twice after the operation. On the basis of Porta's experiments we know that, in cases of interruption of the main artery, circulation is maintained by collateral branches. Although in the present case this circulation was apparently sufficient for peripheral nutrition, its rhythm was not marked and its systolic impact disappeared in the collateral pathways. An effect of the operation due to suggestibility of the patient can be excluded. The patient was not informed of the course of the operation.

In discussing these observations I am aware of the fact that no microscopic data on the injured and ligated femoral artery are available. I am also aware of the possibility of congenital abnormalities of branching of the arteries which might be shown by arteriographic study and which may have been significant. However, there is no doubt that the blood circulation excluded from the femoral artery had to be replaced by collateral circulation and that the latter vascularized the digits better than the previous one. Vascularization from the newly opened collateral pool was therefore more effective than that from the main artery with concomitant constriction of the collateral arteries. If anything new is to be proved from these observations, it is this: With a patent main artery, the irritated periarterial pathways can have a significant influence on the vascular bed below the point of irritation. After this irritation has been excluded the other capillary pool and its circulation can be increased to such a degree that it functions better than the former anatomically normal one. This can occur even in a case in which the main arterial blood supply is excluded.

SUMMARY

In a patient with marked pain in the toes due to frozen legs a periarterial sympathectomy of the right femoral artery was performed. Tough adhesions were present. After finishing the procedure, in attempting to compress a very small opening of the femoral artery, a large opening in the arterial wall developed. Because of friability of the arterial tissue it was impossible to suture the artery. This emergency situation necessitated resection of the artery (about 3 cm.). Half an hour later the condition of the extremity improved. After repeated infiltrations of the lumbar sympathetic nerves no changes were observed. The patient was completely without symptoms (pain, feeling of coolness).

The following explanation is suggested: Resection apparently excluded the factors leading to vasoconstriction and causing the symptoms in the digits. It is not certain whether these influences were mediated in the arterial femoral wall, as no microscopic data were available. Influence from the arterial sheaths on vascularization below the point of action was significant. After exclusion of this influ-

ence the peripheral circulation was functionally more efficient than with normal arterial supply from the femoral artery, in spite of ligation of the artery.

RÉSUMÉ

Un malade, souffrant de douleurs d'orteils aigües après avoir eu les jambes gelées, subit une sympathectomie périartérielle de l'artère fémorale droite. De fortes adhèrences furent découvertes. Après avoir terminé la sympathectomie et pendant que l'on essayait de comprimer un petit trou de l'artère fémorale, une grosse brèche se produisit dans la paroi vasculaire. Le tissu artériel était tellement friable qu'il fut impossible d' y remédier par la suture. Il ne resta donc plus qu'à reséquer d'urgence environ 3 cm. d'artère. Une demi heure plus tard, l'état du membre était amélioré. L'infiltration répétée des nerfs lombaires sympathiques ne décela aucun changement. Le malade demeura asymptomatique (absence de douleurs et de sensation de froid).

L'auteur présente l'explication suivante: la résection apparemment élimina les facteurs qui causaient la vasoconstriction et les douleurs d'orteils. Comme les données microscopiques nous manquent, on ne peut affirmer que cette action prit place dans la paroi vasculaire fémorale. L'influence des gaînes artérielles sur la vascularisation au-dessous du niveau opératoire est importante. Cette action étant annulée, la circulation périphérique fonctionna de facon plus efficiente, en dépit de la ligature de l'artère, qu'avec l'apport sanguin normal de l'artère fémorale.

RIASSUNTO

Ha eseguito una simpatectomia periarteriosa dell 'arteria femorale destra in un paziente con forti dolori da congelamento delle dita dei piedi. Alla fine della simpatectomia, nel comprimere un piccolo foro dell 'arteria femorale, si e' determinata una larga apertura delle pareti arteriose. Data la fragilita' delle pareti stesse el 'impossibilita' di una sutura, si e 'imposta una resezione (di circa 3 cm.) dell'arteria. Le condizioni dell 'arto migliorarono mezz'ora dopo l'operazione. Ripetute infiltrazioni del simpatico lombare non modificarono le condizioni locali: assenza di dolori, di senso di freddo.

L'A. ritiene che la resezione dell'arteria ha eliminato gli stimoli che determina ono la vasocostrizione ed i disturbi di circolo delle dita dei piedi. Manca pero 'la certezza che questi stimoli si trasmettevano attraverso le pareti dell'arteria femorale, data la mancanza di controlli microscopici. Rimane il fatto che nonostante la legatura dell'arteria, la funzione vascolare periferica e' miglio rata di fronte a quella che era con un normale afflusso di sangue dall'arteria femorale.

RESUMEN

Se practicó una simpatéctomía periarterial en la arteria femoral derecha en un paciente con intenso dolor en los dedos del pie debido a una heladura de las piernas. Se observó la existencia de fuertes adherencias. Una vez terminada la operación y al intentar comprimir una pequeña abertura existente en la arteria femoral se presentó otra de gran tamaño en la pared arterial. Por la friabilidad del tejido arterial fué imposible suturar la arteria, requiriendo este problema de urgencia la resección arterial (unos 3 cm.). Media hora más tarde mejoró el estado de la extremidad. Después de practicar infiltraciones repetidas de los nervios simpáticos lumbares no se observaron otras alteraciones, continuando el paciente sin los síntomas de dolor y sensación de frialdad.

El autor propone la siguiente explicación: La resección excluyó, al parecer, los factores que determinaban la vasoconstricción y causaban los síntomas existentes en los dedos de los pies. No ha podido determinarse con seguridad si estas influencias estaban actuando sobre la pared de la arteria femoral, por carencia de datos microscópicos. Fue de importancia la influencia de las vainas arteriales sobre la vascularización por debajo del punto de acción. Después de la exclusión de estas influencias, la circulación periférica continuó funcionando de un modo más eficiente que con la irrigación arterial normal de la arterial femoral, a pesar de haberse practicado la ligadura de la arteria.

Parotid Gland Tumors and Their Surgical Management

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CLARIFICATION of the exact surgical anatomy and pathology of the parotid gland seems to have lagged behind professional knowledge of other organs accessible to surgical treatment. As a result of incorrect or misleading information, the treatment of tumors of the parotid gland has in many instances been inadequate. Neoplasms of this gland may remain completely curable for a decade or more. Yet, because of misconceptions concerning their malignant nature and proper treatment, many are allowed to pass into gross and incurable malignancy.

Interest in the surgical treatment of tumors of the parotid gland has been given a great stimulus by the pioneer work of Hamilton Bailey.[1] He has made surgeons cognizant of the deficiencies in their knowledge of the anatomic, pathologic and clinical aspects of the parotid gland.

It is our purpose here to dispel some of the common misconceptions concerning parotid tumors, to review some critical points of the surgical anatomy and pathology of the organ and to describe an adequate surgical procedure for removal of tumors of the gland.

ANATOMIC CONSIDERATIONS

The most important addition to our knowledge of the surgical anatomy of the parotid gland was observed clinically by Hamilton Bailey and demonstrated in the laboratory by McCormack, Cauldwell and Anson.[2] They showed that the gland is consistently bilobular; that the superficial, spreading portion of the gland is connected to the smaller, deep portion by an isthmus. They demonstrated further that the facial nerve lies *between* the superficial and the deep portions of the gland, and that the isthmus is embraced by the temporofacial and cervicofacial divisions of the nerve. This was the source of the expression that refers to the facial nerve as "the meat in a parotid sandwich." Another important point is the presence of frequent anastomoses between the two main divisions of the seventh nerve distal to the isthmus. The clinical importance of these observations will be noted later.

The parotid gland develops during the eighth week of fetal life from the oral ectoblast along the lateral groove separating the upper and lower jaws. Its origin differs from that of the submaxillary and sublingual glands, which develop from a ridgelike structure in the buccal epithelium occupying the furrow in the angle between the base of the tongue and the floor of the mouth.

The fully developed gland lies behind the upper part of the ramus of the mandible, which it overlaps medially and laterally. A forward prolongation over the masseter muscle superior to Stenson's duct is sometimes designated as the accessory parotid. The enveloping parotid sheath is continuous with the fascia of the neck as it passes upward from the sternomastoid muscle to the zygomatic arch. The space occupied by the parotid is bounded in front by the ramus of the mandible. The posterior margin is composed of the external auditory meatus, the tympanic plate, the base of the styloid process, and the front of the atlas. These walls meet above at the petrotympanic fissure. The posterior wall is prolonged laterally by the posterior belly of the digastric, the stylohyoid and the sternomastoid muscles. The lower part of the styloid process, the styloglossus and stylopharyngeus muscles, and the stylomandibular ligament bound the posterior portion of the gland on its medial aspect. There is no wall to the space occupied by the gland anterior to the styloid process, so the parotid rests on the fat and areolar tissue on the wall of the pharynx.

The superficial portion of the gland overlying the masseter muscle has the least limitation to growth, so it may extend upward to

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the zygoma, anteriorly over the edge of the masseter muscle and inferiorly until it is in contact with the submaxillary gland.

Stenson's duct emerges from the anterior aspect of the gland above its middle and courses over the masseter and through the buccinator muscles to enter the oral cavity. It lies in approximately the midde third of a line between the lower margin of the concha of the ear and the midpoint of the upper lip.

PATHOLOGIC OBSERVATIONS

Tumors of the salivary gland constitute 1 to 2 per cent of all tumors. Tumors of the parotid gland account for about 80 per cent of salivary gland tumors.

Since Virchow described mixed tumors of the parotid in 1863, extensive study of tumors of the salivary gland has been carried out by Ewing, Boyd, McFarland, and others. In spite of the number of neoplasms examined, there is persistent disagreement concerning histogenesis, classification, and cytologic identification of individual tumors.

Fig. 1.—Hamilton Bailey incision. Superficial lobe of the parotid gland removed; mastoid process resected to expose main trunk of seventh nerve. Cervicofacial and temporofacial divisions of seventh nerve encircle isthmus. (Courtesy of Hamilton Bailey.)

We prefer the following simple classification of parotid tumors:

1. *Cyst.*—Simple cyst is rare. It may develop as a result of atresia, obstruction, or congenital defects in the ducts The unsubstantiated diagnosis of "cyst" is a dangerous one, as malignant tumors may present cystic degeneration when first seen.

2. *Adenoma.*—A tumor occurring but rarely in the parotid, the adenoma is encapsulated, grows slowly, and mimics the parent gland in microscopic appearance. The safe time to make the diagnosis of adenoma is after complete removal of the tumor.

3. *Adenocarcinoma.* — Adenocarcinoma, simple or papillary, accounts for less than 10 per cent of parotid tumors. The microscopic appearance may be well differentiated and innocent, but the ultimate fate of the patient with adenocarcinoma is sufficient evidence of the treacherous nature of this tumor. Adenocarcinomas tend to be poorly demarcated and infiltrating. The rather confusing terms "oncocytoma" and "cylindoma" designate a type of adenocarcinoma. As a rule, the growth of an adenocarcinoma is more rapid than that of the other parotid tumors; for this reason patients with adenocarcinoma usually seek treatment earlier.

4. *Mixed Tumors.*—Approximately 75 per cent of parotid tumors are so-called "mixed tumors." These are not confined to the salivary glands; they have been described as occurring also in the lacrimal glands, the nares, the tonsils and the lips. The typical site of origin in the parotid is in a comparatively circumscribed area just above and in front of the angle of the mandible. Occasionally the tumor develops just anterior to the tragus, in which position it may be confused with an enlarged preauricular lymph node.

Mixed tumors usually appear in patients from 20 to 40 years of age.[3] They grow slowly, and may reach a diameter of 10 cm. They are usually ovoid but sometimes lobulated. Microscopically the tumors are made up of three components: complexes of epithelial cells in cords or ductlike structures; connective tissue of the mucoid type, and a substance identified as cartilage or pseudocartilage. The genealogy

of these tumors is not certain.

There is a pronounced tendency toward recurrence following removal of these tumors. Marshall and Miles[4] reported on mixed tumors of the parotid in 89 patients, 25 of whom had undergone previous surgical treatment. Ligation of the salivary ducts in dogs is said to produce mixed tumors; this gives rise to speculation as to the effect of interference with secretion following surgical removal of part of the gland.

5. *Entodermal Cyst.*—Sometimes known as adenolymphoma or papillary cystadenoma lymphomatosum, this rare and benign tumor probably arises from the lymphoid conglomerate that surrounds the first branchial cleft. It is a bulky mass of lymphoid tissue more closely resembling that of the tonsil than that of the salivary gland. It is dangerous to diagnose this tumor unless the lesion is bilateral, particularly if the diagnosis implies a less radical treatment than that indicated for mixed parotid tumors.

6. *Tumors of Nonglandular Origin.*—A variety of rare tumors arising from blood vessels, the facial nerve, lymphoid tissue and fibrous tissue of the capsule of the gland must be remembered. It may be helpful to recall that hemangioma is the most common tumor of this region in infants. Preoperative clinical diagnosis of this group of lesions is not usually made.

SOME COMMON MISCONCEPTIONS AND FEARS

We should now like to consider briefly some of the popular misconceptions and fallacies that have impeded progress in the treatment of parotid tumors.

1. *The Fear of Facial Palsy.*—This is the most common deterrent in the way of recommending or performing adequate surgical treatment of the parotid gland. Too often there is a specter with an expressionless face, a drooping mouth and a tear-moistened cheek which appears when we speak of operating on this gland. We have found that major facial palsy occurs after division of one of the primary branches of the seventh nerve, but normal or nearly normal function returns after weeks or months. The anastomotic branches anterior to the parotid isthmus are no doubt responsible for recovery.

Facial palsy due to invasion of the seventh nerve by tumor is more frequent than that due to operation. There would seem to be no rational objection to operation on the basis of fear of injury to the seventh nerve.

A less known but equally troublesome result of nerve damage in the parotid region is the auriculotemporal (Frey's) syndrome.[5] When the patient with this injury eats, the cheek becomes hot, flushed and moist with perspiration. Hyperesthesia of the face is noted, especially during shaving.

2. *The Fallacy of Waiting for the Tumor to Grow Larger.*—The observation by McFarland[6] and by Kennon[7] that the recurrence rate was higher after removal of small tumors may be the basis of the practice of "waiting for the lump to get bigger." There are two explanations of this seeming paradox: one is that "small" tumors are commonly removed through short incisions, which give unsatisfactory exposure and result in incomplete removal; the second reason is that it is impossible to determine when a tumor is "small." Many parotid tumors present small surface swellings that mask a much larger underlying tumor. It has also been observed that pinhead-sized additional tumors may occur in juxtaposition to the large, more easily discernible tumor.

3. *The Ugly Scar.*—As we shall point out later, an anatomically correct incision may at the same time be cosmetically acceptable. Small transverse incisions designed to parallel the branches of the facial nerve should be abandoned in favor of an incision that displays the gland in its entirety.

4. *Fear of Salivary Fistula.* — Fistula rarely or never develops after removal of large portions of the parotid gland. A persistent fistula should make one think of persistent tumor.

5. *The Pitfall of the Preauricular Lymph Node.*—Mixed parotid tumor may be misdiagnosed as an enlarged lymph gland. The common sites of occurrence of mixed tumors should be kept in mind. If there is no obvious explanation for lymphadenopathy and the swelling continues to grow, the diagnosis of mixed tumor must always be considered.

6. *The Pseudocyst.*—The mixed tumor may be so soft and cystic as to lead the surgeon to

suppose that he is removing a cyst. A cystic swelling is too often thought to be innocuous. Recall that simple cysts are rare and that the diagnosis of adenolymphoma should not be made in the presence of a unilateral lesion.

7. *Roentgen Therapy.*—Nearly all parotid tumors are definitely radioresistant. Adenolymphoma is the one possible exception that would respond to roentgen therapy. McFarland, after following patients with parotid tumors for years, found that no benefit resulted from this form of treatment. Janes,[8] of Toronto, who studied this subject, knows of no instance in which cure has been effected by roentgen therapy. He has, however, observed deep, penetrating ulcers and intolerable pain which resulted from this treatment.

TECHNICAL CONSIDERATIONS

1. Anesthesia.—We routinely employ general inhalation anesthesia. Use of the endotracheal method permits easier access to the operative field, but the ordinary closed system with mask is satisfactory in some cases. Local anesthesia is frowned upon; inadequate anesthesia too often results in inadequate surgical handling. Further, the infiltration of tumor-bearing tissue and the obscuring of an already disturbed anatomic picture should be discouraged.

2. Incision.—One of two incisions may be employed. That preferred by Hamilton Bailey is a J-shaped incision from the level of the zygomatic arch, passing close to the pinna, curving around the root of the lobule of the ear to the tip of the mastoid process. If this incision does not permit visualization of the whole parotid gland, it may be extended downward on the anterior margin of the sternomastoid muscle (Fig. 1).

The incision we prefer is one that passes from the zygomatic arch downward, very close to the pinna of the ear, and continues to just behind and below the angle of the mandible, then turns abruptly below the body of the mandible in one of the natural skin folds of the neck (Fig. 2). The lateral flap of this incision is then undermined from the region of the external auditory meatus. This exposes the posterior and inferior margins of the gland. In order to injure the facial nerve at this point, the operator would have to cut completely through the superficial portion of the gland. If ligation of the external carotid is to be done prior to dissection of a large tumor, it is done before flap dissection is initiated. The medial flap is then dissected free until the zygomatic arch, the body of the zygoma, the anterior edge of the masseter muscle and the mental foramen have been reached. If the tumor permits, the sheath of the parotid gland is reflected from behind forward as part of the flap. The field is now prepared for the definitive surgical procedure.

At this point it is well to insert a warning against an attempt to enucleate the tumor. In nearly all parotid tumors enucleation is an illusion. Small satellite tumors or tentacle-like extensions of the parent tumor, neither grossly discernible, may be left behind in spite of the appearance of clean enucleation. Attempts to shell out apparently discrete lesions no doubt account for most of the high recurrence rate (30 per cent or more) of mixed parotid tumors. Local excision of a parotid tumor would seem to be as irrational as local excision of a malignant tumor of the stomach or rectum.

The origin of most parotid tumors in the superficial lobe of the gland is a factor in favor of the surgeon. *Superficial lobectomy* (a term suggested by Bailey) will provide adequate tissue excision in most cases.

If lobectomy or total parotidectomy is elected, preliminary ligation of the external carotid artery will obviate much troublesome bleeding. The longest portion of the external carotid without branches, and therefore the easiest to ligate, is that between the superior thyroid and lingual arteries.

The superior margin of the gland should be cleared first, followed by cleaning of the anterior-superior aspect of the superficial lobe. The buccinator branch of the facial nerve will be identified superficial to Stenson's duct. This branch may be used as a key to the depth of the proximal divisions of the nerve. Stenson's duct is left intact, and removal of the superficial lobe of the gland is carried out from before backward until the isthmus is reached. If it is necessary to divide Stenson's duct, it is excised at this point. The isthmus may now be divided, care being exercised to avoid the major divisions of the facial nerve.

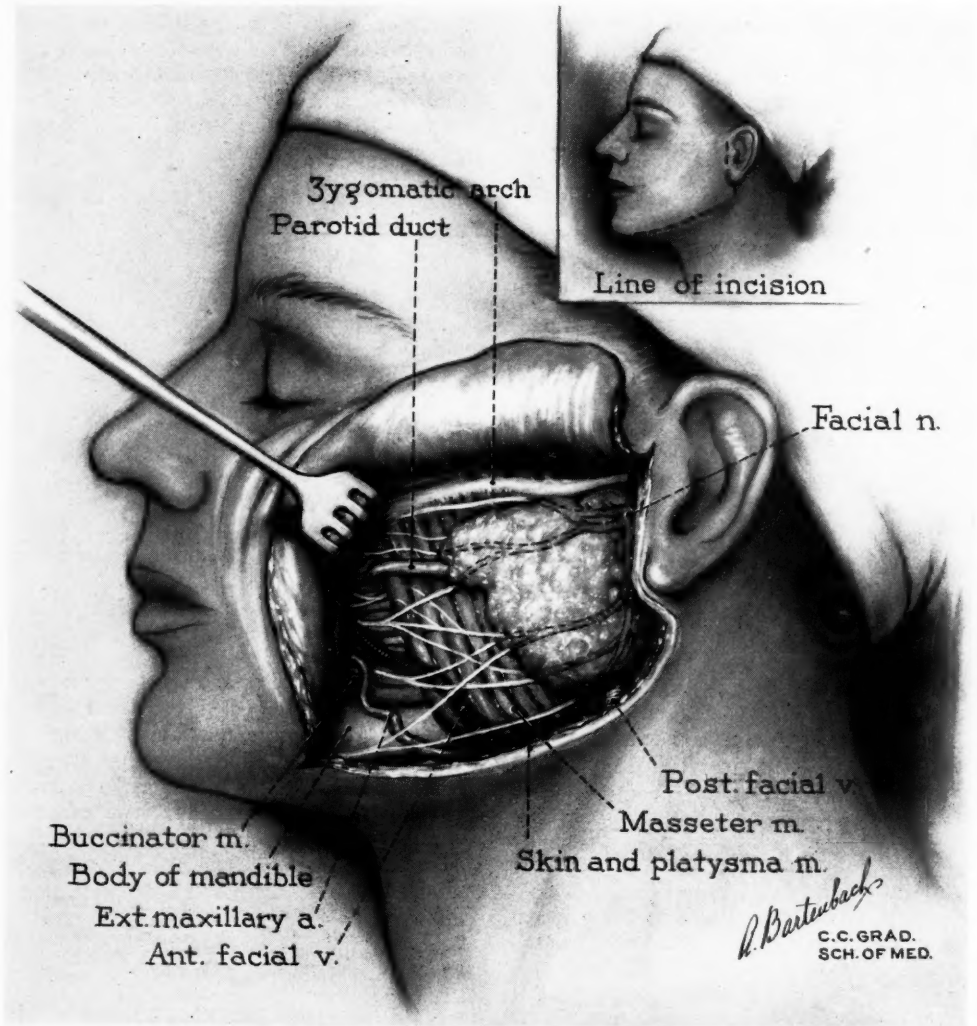

Fig. 2.—Incision utilized by authors. Note wide exposure obtained through an incision that will leave an unobtrusive scar.

Bleeding may be encountered from the external carotid artery or its branches and the posterior facial vein, which lie posterior to the isthmus, usually deep to the seventh nerve. The auriculotemporal nerve may be severed at this same point, posterior to the isthmus, where its course nearly parallels that of the vessels. This maneuver completes the superficial lobectomy.

If it is necessary to excise the deep lobe of the gland for a large tumor wedged in the space between the ramus of the mandible and the mastoid process, it is best to carry out the dissection outlined above as a preliminary step. If there is a question of damaging the main trunk of the seventh nerve, it may be well to resect the tip of the mastoid process, as suggested by Janes, in order to expose the

stylomastoid foramen and trunk of the nerve. The posterior and lateral surfaces of the deep lobe are then freed so as to mobilize the lobe prior to the more hazardous dissection of its medial and anterior surfaces.

INJURY TO THE FACIAL NERVE

Permanent and significant facial palsy will result only if the *main trunk* of the seventh nerve is divided proximal to the parotid isthmus. Recovery of function is the rule after damage to branches of the nerve anterior to the parotid isthmus.

Transitory paresis due to division of lesser branches of the seventh nerve may be corrected by the use of supporting adhesive strips. If drooping of the mouth persists, Dahlberg's internal splint (a dental prosthesis) may be employed.[9]

Division of the main trunk of the nerve is best avoided by initial excision of the superfical lobe and by resection of the mastoid process if the course of the nerve is still obscure. In cases of permanent palsy, one of the plastic procedures, such as the Lodge fascial transplant,[10] J. B. Brown's technique of subcutaneous fascial strips attached to the temporal muscle,[11] or the employment of braided tantalum sutures[12] in similar fashion, is recommended.

SUMMARY

1. Attention is called to certain deficiencies in present knowledge related to the surgical anatomy and pathology of the parotid gland. Critical points of anatomy are reviewed, with special emphasis on the relations of the facial nerve.

2. Several common misconceptions concerning the management of tumors of the parotid gland are considered. The practices of waiting for tumors to become large, of performing inadequate surgery because of fear of injury to the facial nerve and the unjustified use of roentgenotherapy are particularly condemned.

3. The technics of subtotal parotidectomy (superficial lobectomy) and parotidectomy, with the patient under general anesthesia, are described. Emphasis is placed first on removal of sufficient tissue; preservation of the facial nerve is held to be of great importance, but secondary in importance to complete excision of the neoplasm.

4. Methods of management of temporary or permanent facial palsy are outlined.

RÉSUMÉ

1. On attira l'attention sur certaines insuffisances dans l'état actuel de nos connaissances relatives à l'anatomie chirurgicale et à la pathologie de la glande parotide. Certains points délicats de l'anatomie sont passés en revue en donnant une place prépondérante aux rapports du nerf facial.

2. On considéra plusieurs erreurs de conseption concernant le traitement des tumeurs de la glande parotide. La méthode qui consiste à attendre l'accroissement de la tumeur ou à réaliser une opération chirurgicale inadaptée par crainte de blesser le nerf facial, et l'emploi injustifié de la roentgenothérapie sont particulièrement condamnés.

3. On décrit les techniques de la parotidectomie sub-totale (lobectomie superficielle) et de la parotidectomie, le malade étant sous anesthésie générale. On insiste surtout sur l'ablation d'un tissu glandulaire suffisant; on tient pour trés importante la préservation du nerf facial, mais toutefois d'une importance secondaire par lapport à l'excision complète du néoplasme.

4. Les méthodes de traitment pour la paralysie faciale temporaire ou permanente sont décrites.

RESUMEN

1. Se destaca lo limitado de nuestros conocimientos actuales sobre la anatomìa, y anatomía patológica de la glándula parótida, revisándose algunos puntos fundamentales de su anatomía con relación especial al nervio facial.

2. Se analizan algunos errores frecuentes referentes al tratamiento de los tumores de la glándula parótida. La costumbre de esperar a que los tumores se hagan de gran tamaño o de intervenirlos quirúrgicamente de modo inapropiado por temor a lesionar el nervio facial, y el uso inadecuado de la roentegenterapia, son objeto de la crítica severa del autor.

3. Se describe la técnica de la parotidectomía subtotal (lobectomía superficial), y de la parotidectomia, sometiendo al paciente a la anestesia general. Se insiste ante todo en extirpar suficiente cantidad de tejido parotídeo, dando suma importancia a la conservacion del nervio facial aunque ello es secundario a la resección total de la neoplasia.

4. Se esbozan los métodos de tratamiento de la parálisis facial, temporal o permanente.

RIASSUNTO

1. Richiama l'attenzione sopra talune lacune nelle attuali conoscenze sopra la patologia e l'anatomia chirurgica della parotide. Passa in rassegna i punti salienti dell'anatomia della ghiandola, con speciale riguardo ai rapporti con il nervo facciale.

2. Pone in rilievo parecchi falsi postulati rispetto la cura dei tumori della parotide. Condanna, per esempio, sia la tendenza ad aspettare che i tumori diventino voluminosi, sia la frequenza di operazioni non complete per il timore di lesioni del nervo facciale, sia infine l'uso ingiustificato della radioterapia.

3. Descrive la tecnica della parotidectomia subtotale (lobectomia superficiale) e della parotidectomia in anestesia generale. Sottolinea la necessita' di asportare una quantita' sufficiente di tessuti, poiche' la conservazione del nervo facciale passa in seconda linea di fronte all'importanza di un'escisione completa dei tumori.

4. Riepiloga i metodi di cura della paralisi temporanea o definitiva.

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An Embarrassment of Riches

The response to Dr. Acuff's request for contributions to this Special Issue was so generous as to exceed all expectations. We regret deeply that we are unable to include them all even after dividing certain of the longer articles for presentation in two instalments and even after eliminating, one by one, *all* of the special departments which customarily appear in the concluding pages of the *Journal* every month.

Since our only alternative would have been cutting down these valuable articles to a wholly unjustifiable extent, we are sure that both readers and contributors will approve our decision to defer publication of a few papers for one month only. All remaining material will appear in the June issue of the *Journal*. Each article will carry an explanatory footnote designating it as a contribution to the Special Issue.

A Study Based on Forty-One Years of Thyroid Surgery

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MY EXPERIENCE with goiter is larger than the title indicates, because it began with my assistantship with Roux of Lausanne and Kocher of Berne, Switzerland. This, however, represents my personal work with the thyroid gland over a period of forty-one years (1909 to 1950).

If to these 11,139 thyroidectomies 523 ligations are added, the total number of thyroid operations will amount to 11,662.

Terminology.—For the sake of clarity the terminology used in this discussion should be made clear. Goiter may be classified into three main types: (1) diffuse parenchymatous goiter, (2) diffuse colloid goiter, and (3) nodular colloid goiter. Each of these three types is either (*a*) toxic or (*b*) nontoxic. The three main types may be defined as follows:

Diffuse parenchymatous goiter is a diffuse hyperplasia of normal thyroid parenchyma. The whole gland is usually involved. The gland may contain very tiny colloid nodules, which cannot be detected by palpation; clinically, however, the glandular hyperplasia remains a diffuse parenchymatous goiter until microscopically proved otherwise.

Before the advent of iodine prophylaxis the *diffuse colloid goiter* was much more common than it is today. This change is obviously due to the extensive iodization of the population.

Nodular goiter is a definite lump with a well defined capsule and clearly defined limits. There is nothing discrete about it; it may be rolled around within the gland itself. It may be single or multiple. Clinically speaking, whether this nodule is a true colloid or a mixed colloid and cystic nodule, whether it is a fetal adenoma (Wölfler) or not, or whether it is an incipient malignant growth, cannot always be told by palpation. Only the microscope will tell. It may be suspected; that is all.

In diffuse parenchymatous and colloid glands one frequently observes diffuse bosselations, diffuse nodulations, which may be confused with true nodules. They are not true nodules. They are not encapsulated; their limits are indistinct. They correspond to areas of localized hyperplasia surrounded by areas of involution.

Thyrotoxicosis.—Parry's disease, (Parry antedated Graves); Graves' disease; Basedow's disease; exophthalmic goiter; hyperthyroidism; morbodi Flajani, and thyrotoxicosis are all synonymous. The English called it Graves' disease because it was described by the Englishman, Graves. The Germans called it Basedow's disease because Basedow described it. The French called it goitre exophthalmique because of the exophthalmos. The Italians called it *morbo di Flajani* because Flajani described it. Mayo called it hyperthyroidism because he accepted the theory of hypersecretion of Moebius. Kocher called it thyrotoxicosis. Whatever it is called, the same changes in the basal metabolic rate, the same cardiovascular reactions, the same gastrointestinal disturbances, the same tendency to ocular signs, and the same nervous phenomena are present.

It does not seem justifiable to consider Graves' disease or exophthalmic goiter a different disease from *thyrotoxic nodular colloid goiter,* the so-called *toxic adenoma,* or *hyperfunctioning adenoma.* Fundamentally, they are the same, and are caused by hyperfunction of the thyroid. To be sure, their reactions may be in many ways different. A thyrotoxic diffuse parenchymatous goiter or exophthalmic goiter, developed in a thyroid physiologically normal up to the time of onset, reacts more violently than does a degenerated gland in which a nodular colloid goiter has developed. The response is the same, but the *degree of reaction differs.* It is still the same disease.

It has been said that the exophthalmos associated with exophthalmic goiter is a distinctive characteristic and does not occur with toxic adenoma. The statement is inaccurate. Exophthalmos does occur with toxic adenoma, but not so often and not to so marked a degree as with exophthalmic goiter. But again, it is only a matter of degree. In my series of 5,924 thyroidectomies for toxic nodular and diffuse

colloid goiters, the incidence of exophthalmos was 0.5 per cent, while the incidence of exophthalmos in 3,074 thyroidectomies for thyrotoxic parenchymatous goiters was 24 per cent. Not only are the general symptoms the same; the treatment also is largely the same. Both conditions respond to antithyroid medication, iodine, thiouracil and radioactive iodine, as well as to surgical intervention.

Comment.—Table 1 shows that the frequency of diffuse and nodular colloid goiter exceeds that of diffuse parenchymatous goiter in a ratio of 3 to 1; that the sex incidence is 5 to 1 in favor of the female, and that the global incidence of toxic goiter far surpasses that of the nontoxic type. It is rather surprising to find that the majority of nodular colloid goiters are toxic.

To call the hyperthyroid syndrome hyperthyroidism is inadequate, since it can hardly apply to thyrotoxic patients with low metabolism. To call the syndrome by the name of any one investigator is not desirable, nor is it just to the other scientists who have advanced our knowledge of the disease. Until we know the true etiologic mechanism of toxic goiter, therefore, I shall call the hyperthyroid syndrome thyrotoxicosis. This term is simple and clear.

Ligation is no longer employed in my operations. It has been replaced by administration of Lugol's solution and antithyroid medication combined and, when necessary, by external roentgen treatment. One cannot but note the high mortality rate (4.4 per cent) for so simple and short an operation. Most of the ligations referred to in Table 2 were made prior to the advent of Lugol's solution and antithyroid medication and also prior to standardization of the clinical handling of such conditions.

THYROIDECTOMY FOR NONMALIGNANT GOITER: MORTALITY RATES

This study is based upon 10,947 thyroidectomies. Operations for malignant goiter are not included. Table 3 presents the mortality rates in statistical form. One finds, contrary to expectation, that nodular goiter carries a higher death incidence than does diffuse parenchymatous goiter. Advancing age, with all its incidental decrepitudes, no doubt accounts for the discrepancy.

The death rate in thyroidectomy depends upon: (1) preoperative preparation; (2) anesthesia; (3) judgment at the operating table; (4) faultless and speedy technic, and (5) appropriate postoperative care.

Preoperative Measures.—After the physical and laboratory examinations are completed, the patient is kept in bed. A high calory diet with increased protein and carbohydrate intake is given three times a day. Coffee, tea, alcohol and tobacco are tabooed. It has been shown that tobacco raises the basal metabolic rate. Patients with cardiac disease are hospitalized and given the usual treatment; iodine and propyl-thiouracil are given simultaneously. When cardiac compensation is established, the basal metabolic rate is at a safe level, and thyrotoxicosis is controlled, thyroidectomy is done. Antithyroid medication consists of Lugol's solution alone in cases of moderate involvement, with proply-thiouracil added if the condition is severe. Appropriate cardiac medication is given if organic cardiac disturbances are present. The basal metabolic rate is brought down to safe limits, to or below plus 25; it is not wise to operate while a higher metabolic level exists.

When Lugol's solution and propyl-thiouracil medication do not bring about the expected remission, a series of intravenous sodium iodide injections is given. If even this proves insufficient, a series of five to eight roentgen treatments is added.

In cases of critically toxic goiter the intravenous injection of sodium iodide two to four times a day, or oftener if need be, is started at once and continued as long as the patient's condition remains threatening. At the same time, antithyroid medications, Lugol's solution and propyl-thiouracil are given to the limit.

Roentgen treatment should not be undertaken during the early, acute critical stage; it will almost certainly induce a severe thyroid crisis, in the same way as a ligation or a partial thyroidectomy would do if performed during the critical stage. The patient would probably die.

In such critically ill patients it is imperative to prevent dehydration and to provide for a high calory diet, rich in protein and carbohy-

TABLE 1.—*Statistical Summary*

Thyroidectomies				*Incidence, %*
Diffuse parenchymatous	3,189			28.6
Nodular colloid	5,696			51.2
Diffuse colloid	1,958			17.5
Malignant	192			1.72
Chronic thyroiditis	99			0.87
Thyroglossal fistula	5			0.04
Thyroidectomies	11,139			100
Ligations				
In 11,139 thyroidectomies				
Male patients	1,820			17
Female patients	9,319			83
Diffuse parenchymatous	3,189	Toxic	3,074	96.4
		Nontoxic	115	3.6
Diffuse colloid	1,958	Toxic	1,562	79.7
		Nontoxic	396	20.3
Nodular colloid	5,696	Toxic	4,362	76.5
		Nontoxic	1,334	23.5
Total benign goiters, 10,843				

drate. Frequent feedings, even hourly, are given through a nasal tube left in situ. Sedatives should be given freely until the critical condition is over. The same is true for antipyretics when the fever is high. Ice packs are useful. Transfusions are strongly indicated.

One must always bear in mind that some patients (11 per cent) are refractory to Lugol's solution. The same is true of thiouracil. For them, radioactive iodine should prove helpful. I have no experience with it as yet.

It is mandatory that no attempt at surgical intervention be made unless the patient appears safely ready for it. When that time comes the patient is given an intravenous injection of sodium iodide the day before the operation, whether he is thyrotoxic or not. I have made this rule ever since a patient with simple nontoxic goiter died of thyroid crisis after thyroidectomy. No patient is ever operated upon unless he has received preoperative iodine medication, no matter if he is nontoxic.

Anesthesia.—I do not believe in local anesthesia for thyroidectomy. Sodium pentothal and nitrous oxide are, in my judgment, the agents of choice.

When a patient is apprehensive and toxic, sodium pentothal is administered in his room, and when unconscious he is transported to the operating room, where nitrous oxide is administered. The patient is thus saved the stage of apprehension and nervous excitement, which is always detrimental. When the margin of safety is small, this safeguard may mean the success of the operation. At any rate, most patients are grateful to have been kept in ignorance as to the actual time of operation.

Intratracheal anesthesia is used when needed. A highly competent anesthetist is a gift of the gods; he reduces the mortality.

Judgment at the Operating Table.—When the patient is draped and ready for the opera-

TABLE 2.—*Ligation*

Total number of ligations		523
Ligations without thyroidectomy		98
Ligations followed by thyroidectomy		425
	Total	523
Deaths in ligations		
Diffuse parenchymatous goiter		13
Diffuse colloid goiter		2
Nodular colloid goiter		8
Cause of Death		
Pneumonia		1
Cardiac disease		7
Shock		1
Thyroid crisis		12
Unknown		2
Sex		
Male		3
Female		20

tion, the surgeon's decision may mean life or death.

When anesthesia has been complete for several minutes and the cardiac rate, which was elevated at first, comes down to a safe level (90 to 110) and stays at that level, one may proceed with the operation. If the cardiac rate does not come down, but remains at the same high level as when anesthesia was started the patient is not fully ready for surgical treatment. A cardiac rate that remains at a level of 125 or more means a cardiac rate of 175 or more at the end of the operation. The remission is not yet within safe bounds, and the operation must be postponed to a later date.

Faultless and Speedy Technic.—One-stage or two-stage operations? In my judgment, *one-stage, bilateral resection and isthmectomy* is the method of choice. I have adhered to this principle throughout my 11,139 thyroidectomies. I have not performed a single unilateral resection, unless one of the two lobes was entirely normal, and I have not performed a two-stage thyroidectomy unless an emergency demanded it.

If a patient has undergone adequate preoperative treatment, and if he is deemed capable of going through a unilateral resection, I personally feel that he is able to stand the full operation. Upon this principle I have acted all the way through.

When the condition is a serious one, and after the patient has been fully anesthetized, if I have any misgivings about the outcome I do not operate, but postpone intervention to a more suitable time. But when that time comes, I perform a bilateral and not a unilateral resection.

The isthmus is always removed, if only for cosmetic reasons. If one leaves the isthmus one runs the risk of overlooking the pyramidal process. It is a rule without exception to dislocate forward a lobe which appears to be normal. In so doing one will discover a discrete, small, incipient thyroid nodule, which later may give rise to a recurrence or a malignant goiter.

I feel that any surgeon who has fully mastered the technic of thyroidectomy, who makes every motion count, so as to proceed swiftly though surely, and who, through experience,

TABLE 3.—*Mortality Rates*

Types of goiter	Deaths	Per cent
Diffuse parenchymatous, 3,189	60	1.8
Diffuse colloid, 1,958	15	0.76
Nodular colloid, 5,696	117	2.0
Total number of thyroidectomies		10,947
Total number of deaths		192

In 10,947 thyroidectomies for benign goiter, the total death incidence was 1.76 per cent.

However, as the skill and experience of the surgeon grow, the death rate decreases. From 1920 to 1930, thyroidectomies for benign goiter totaled 4,956. There were 75 deaths, or 1.8 per cent.

Type of Goiter	Deaths
Diffuse parenchymatous	
Toxic	23
Nontoxic	0
Diffuse colloid	
Toxic	10
Nontoxic	0
Nodular colloid	
Toxic	37
Nontoxic	5
Total number of deaths	75

From 1940 to 1950, 3,043 thyroidectomies were performed for benign goiter. There were 24 deaths, or 0.8 per cent.

Type of Goiter	Deaths
Diffuse parenchymatous	
Toxic	6
Nontoxic	0
Nodular colloid	
Toxic	16
Nontoxic	2
Total	24

In the last 1,000 thyroidectomies there were 3 deaths, or 0.3%. This series included:

609 nodular colloid goiters	
Toxic	328
Nontoxic	281
111 diffuse colloid goiters	
Toxic	75
Nontoxic	36
245 diffuse parenchymatous goiters	
Toxic	231
Nontoxic	14
35 instances of chronic thyroiditis	
Riedel's	21
Hashimoto's	13
Syphilitic (discovered postoperatively)	1
Total	1,000

This survey shows clearly that a nontoxic goiter carries at operation a minimal chance of death. Most of the deaths occur in the toxic group (70 to 5).

has developed sound medicosurgical judgment ought to be able to do the same. There may be some exceptions, but in my opinion they are few.

Appropriate Postoperative Care.—As soon as the patient is returned to his room, he is given routinely an intravenous injection of sodium iodide. The injection is repeated if signs of impending thryroid crisis becomes manifest.

Intravenous physiologic solution of sodium chloride is routinely given. Blood transfusions are instituted when needed. Sedatives are given generously for the twenty-four hours after the operation.

THYROID CRISIS

A postoperative thyroid crisis is only a fulminating form of hyperthyroidism. It is a peracute thyrotoxicosis. The symptoms are the same; the only difference is a matter of degree. If we admit that thyrotoxicosis is caused by an exaggerated amount of thyroxin in the organism (the primary cause of phenomenon is not known) it is logical to admit that a thyroid crisis is due to a sudden flooding of the organism with thyroxin normally fixed in the tissues (about 25 mg.). The operation apparently acts as a releasing mechanism. Its modus operandi is not known.

If we do not know the true cause, we can, however, suspect beforehand that thyroid crisis may occur. The patients in whom a crisis is most likely to develop are the highly emotional, the highly thyrotoxic cardiovascular, the gastrointestinal with vomiting and diarrhea, and the asthenic patients. Special attention should be paid to them.

The thyroid crisis begins at the operating table; the cardiac rate is unduly high during the operation, and afterward it shows a tendency to go still higher. A few hours later it reaches 200 or more. The patient coming out of the anesthetic is unusually restless, tosses about in his bed, wants to get rid of his covers, wants to get out of bed, and especially wants to go home. He talks incoherently and becomes delirious. His delirium is not systematized, he has hallucinations, sees and talks to imaginary persons. The temperature rises to high levels (to 104 to 106 F.). I have observed a terminal temperature of 109 F. Death ordinarily ensues about twenty-four to thirty-six hours after the operation.

Fortunately, thyroid crises are no longer as frequent or as severe as they were formerly, but they do still occur.

Treatment consists of intravenous sodium injections as frequently as every two hours if the crisis is severe. An intravenous drip of dextrose solution, an oxygen tent, and sedatives are resorted to immediately. Blood transfusions are a "must".

Ice packing of the extremities, even of the whole body, is used to combat the fever. Aspirin is helpful for this purpose.

LINE OF CONDUCT FOR TREATMENT OF THYROTOXICOSIS

1. A thyrotoxic nodular goiter is "surgical" as soon as it can be safely operated upon.
2. The early mild forms of thyrotoxicosis in children and young persons should be treated medically unless a special contraindication (nodular goiter) is present. Roentgenotherapy and the administration of Lugol's solution are the methods of choice.
3. Early, well established, typical thyrotoxicosis calls for surgical intervention.
4. Well advanced conditions demand operation as soon as it can be done.
5. Severe advanced conditions of long standing have passed the surgical stage and become medical again. The use of antithyroid medication, including radioactive iodine, is the method of choice. If the patients can be made safely surgical risks, thyroidectomy must be done without delay.
6. The fulminating forms of thyrotoxicosis, the cardiovascular, gastrointestinal and asthenic types, are essentially medical. Any surgical treatment, be it only a simple ligation, or even roentgen treatment during the intense wave of hyperthyroidism, may lead to disaster. Only when remission is substantial and of some duration should operation be contemplated.
7. Patients with mental disease complicated by thyrotoxicosis should be given the benefit of surgical treatment. If thyrotoxicosis is not present, thyroidectomy has little to offer. For thyrotoxic insanity, operation offers complete relief.

8. A certain degree of myocarditis or valvular lesions (provided they are well compensated) is no contraindication to thyroidectomy. However, auricular fibrillation with unsystematized arrhythmia should be well controlled before operation is resorted to.

9. Any thyrotoxic goiter showing a tendency to relapse after remission should be operated upon. The interval operation is the safest procedure.

EXOPHTHALMOS

In 11,139 thyroidectomies and 523 ligations, there were 1,066 instances of exophthalmos, an incidence of 9.14 per cent.

Progressive exophthalmos, 23, or 2.1 per cent of 1,066.

Unilateral exophthalmos, 33, or 3.1 per cent of 1,066.

Of 3,074 toxic diffuse parenchymatous goiters, exophthalmos was present in 764, or 24 per cent. Of 5,924 toxic nodular and diffuse colloid goiters, exophthalmos was present in 302, or 5 per cent.

Table 4 disposes very well of the claim that exophthalmos does not occur in cases of toxic nodular goiter. Not only is it unquestionably present in adults with nodular goiter; the same is true of children. Table 14, to be presented later, shows that exophthalmos was present in 51 of 105 thyrotoxic diffuse parenchymatous goiters, in 6 of 50 thyrotoxic diffuse parenchymatous goiters, and in 2 of 31 thyrotoxic nodular goiters.

The contention, therefore, that exophthalmic goiter, Basedow's disease, Graves' disease, thyrotoxic diffuse parenchymatous goiter, whatever one chooses to call it, is a different disease from the so-called "toxic adenoma" of Plummer because of the absence of exophthalmos in the nodular type does not hold true.

It is my impression that exophthalmos is less common and less severe than it was before the advent of iodine and antithyroid medication. Something has changed the behavior of the toxic thyroid. They are no longer as severely toxic as before. The most probable explanation is that prophylactic iodine medication has resulted in this change.

Another good reason for the reduced incidence of exophthalmos is the exophthalmometer. Before its advent, surgeons used to label as exophthalmos any retraction of the eyelid (Dalrymple sign). Measuring with the exophthalmometer often indicates that exophthalmos is not yet present.

Exophthalmos in Thyrotoxicosis.—In the majority of instances there seems to be a direct relation between the severity of thyrotoxicosis and the degree of exophthalmos. The latter increases with the thyrotoxic syndrome or subsides with the disappearance of the toxic goiter; hence the conclusion that exophthalmos is of thyroid origin. This point of view is corroborated by the fact that, as has been proved experimentally and clinically, forced feeding of desiccated thyroid can and does produce the thyrotoxic syndrome as well as the exophthalmos associated with thyrotoxicosis. It is further substantiated clinically by the results obtained with thyroidectomy.

However, in recent years, owing to the research work of Loeb and Friedman (1932),

TABLE 4.—*Progressive Exophthalmos: Distant Results*

Stationary	6	1 after 14 months	Average, 53 months
		1 after 108 months	
		1 after 54 months	
		1 after 21 months	
		1 after 48 months	
		1 after 73 months	
Recessive	4	1 after 26 months	
		1 after 16 months	
		1 after 38 months	
		1 after 16 months	
Progressive	13	Persistent double vision	2
		Loss of vision	1
		Orbital decompression	2(1 improved, 1 died)

Friedgood (1934), Brian (1936) and others, the trend has been to regard the *pituitary* gland as the primary cause of thyrotoxicosis and its concomitant exophthalmos. The claim is made that an excess of thyrotropic hormone of the anterior pituitary in the blood acts as the primary initiator and induces hyperfunction, thus producing both the thyrotoxic syndrome and the exophthalmos.

There seems to be no question that there is an intimate functional relation between the thyroid and the pituitary in production of the thyrotoxic syndrome, but what the intricate mechanism is, we do not know. The excess of thyrotropic hormone does not seem to be an adequate explanation, since in diseases in which the thyrotropic hormone is abundantly present, such as acromegaly or spontaneous myxedema, no thyrotoxic syndrome or exophthalmos appears (Friedgood).

A frequent characteristic of thyrotoxic exophthalmos is the *absence of mydriasis.* This sign is quite interesting. Stimulation of the cervical sympathetic nerve produces exophthalmos with mydriasis. This is to be expected, since resection of the cervical sympathetic nerve produces enophthalmos and myosis.

In adenoma of the anterior pituitary in acromegaly and in the Cushing syndrome exophthalmos is observed long before the other clinical symptoms occur. Here also mydriasis is absent. This absence of mydriasis would make it appear that thyrotoxic exophthalmos and thyrotropic exophthalmos are the same.

One should remember that exophthalmos experimentally produced with the thyrotropic hormone is by no means constant (9 out of 30 guinea pigs; Friedgood, 1934) and that the effect of thyrotropic hormone upon the thyroid is fleeting and soon ceases to be active no matter how long it is administered. On the other hand, it would appear that thyrotropic hormone does not produce exophthalmos by activating the thyroid gland, since exophthalmos is best obtained in thyroidectomized animals.

Another significant fact is that exophthalmos is observed only with thyrotoxic goiter and not with simple nontoxic goiter. Furthermore, postoperative progressive exophthalmos is observed only after thyroidectomy for *thyrotoxic* goiter and never after thyroidectomy for simple *nontoxic goiter*, no matter how extensive the latter operation has been. Now, if thyroid insufficiency must be present to allow the thyrotropic hormone to produce exophthalmos, why is not exophthalmos present in cases of postoperative myxedema following thyroidectomy for simple nontoxic goiter?

That exophthalmos can be explained on the basis of disturbed autonomic control is perhaps partically probable, but the role of the sympathetic system is not clearly understood. It must be admitted that intimate mechanism responsible for the production of exophthalmos is still unknown.

However, it is not difficult to understand the *mechanical* mechanism that induces the eyes to bulge. It is known that the retrobulbar tissues, fat and muscles, undergo trophic disturbances and become edematous, and that leukocytic infiltration takes place. On the other hand, the orbital space is a pyramid widely opened outside and sharply pointed inside. The walls of the pyramid, being completely bony, are totally inelastic, and pressure from within must of necessity push the orbital content forward and outward. Thus it becomes obvious that if the orbital muscles become unduly hypertrophied and the orbital fat becomes so edematous as to occupy most of the orbital space, the globus oculi must necessarily protrude. There is no other possibility.

Table 4 shows that the incidence of exaphthalmos in cases of diffuse parenchymatous goiter is 764, or 24 per cent. It shows also that exophthalmos in diffuse and nodular goiters is 302, or 5 per cent. In 23 of the total of 1,066 cases of exophthalmos the condition became progressive after the operation; therefore one may conclude that in 2.1 per cent of cases the exophthalmos observed will become progressive.

Progressive Postoperative Exophthalmos.—This condition, although not common, has been and still is the most baffling problem confronting the physician and surgeon. It is frequently the only remnant of the disease that once existed. Its characteristic is to be progressive, leading sometimes to almost complete extrusion of the eyeballs, to total blindness, and to panophthalmitis with all its consequences.

Progressive exophthalmos is more common in men than in women. In this connection, it is interesting to recall that Marine observed male rabbits to be more susceptible than female rabbits to the experimental production of exophthalmos.

The majority of thyrotoxic patients with exophthalmos after thyroidectomy recover fully; the thyrotoxic syndrome disappears altogether, or almost so. Exophthalmos, however, when present, subsides more slowly; sometimes it remains permanently stationary, with no untoward effect on the patient.

In a few instances, sometimes months or even years after thyroidectomy, exophthalmos reappears and follows a progressive course until the lids can no longer cover the bulbus. The lids become extremely puffy; the ocular movements are more and more restricted; the conjunctiva becomes congested and swollen to such an extent that it henriates through the lids. Lacrimation becomes very annoying. Being unprotected, the cornea becomes inflamed, and finally ulcerated; panophthalmitis follows. In the meantime the eyesight has been totally lost. The only course open is enucleation; otherwise, death will ensue. Ordinarily the patient has a low metabolic rate.

The theory that thyrotoxic exophthalmos and progressive postoperative exophthalmos are produced by the same mechanism seems justified. To be sure, there are differences. In thyrotoxic exophthalmos the mobility of the eyeball is not impaired, or at least, very little; in progressive postoperative exophthalmos the impairment is marked. The upward and downward rotation ceases first; later the inward and outward motions disappear. In thyrotoxic proptosis there is usually no chemosis. In the postoperative progressive exophthalmos hyperthyroidism is usually the rule; in thyrotoxic exophthalmos the reverse is usually true.

In both forms of exophthalmos mydriasis is absent. In the two forms, also, the trophic orbital disturbances are the same.

Changes in the retina occur in both forms of exophthalmos, but only in the last stages of the disease.

In the last analysis, however, these two forms of exophthalmos must have a common origin. Probably the trophic disturbances of the orbital muscles are primarily caused by stimulation of the sympathetic nerve, which in turn brings about trophic disturbances. Biological chemical reactions must also play a part in the production of the syndrome.

One thing remains to be explained: Why is it that, even after all other thyrotoxic symptoms have subsided, exophthalmos still persists for a long time and sometimes permanently? Probably because the eyeball, having protruded for so long a time, has lost the "right of domicile" in the orbit; it has acquired new relations; connective tissue and retrobulbar fat have filled the dead space left by the eyeball while it protruded, and it is difficult or even impossible for the globus oculi ever to return to the normal position.

Why is it that thyrotoxic thyroids do not all produce exophthalmos? We do not know.

After seeing a large series of thyrotoxic goiters, one notices that in certain thyrotoxic patients the toxic effects of the hyperthyroid gland seem to center their deleterious effects upon certain organs or systems of organs. In some patients the cardiovascular system seems to be affected disproportionately to the other organs. In other patients it is the gastrointestinal system that is heavily attacked by thyrotoxicosis; vomiting and diarrhea may be intense. In still other patients the ocular system is most markedly involved. This would lead one to believe that certain organs or systems of organs may be unduly *sensitized* to thyroxin, while others are resistant to it. On the other hand, the concept of "sensitization" as an activator may well have a reverse, namely, act as an inhibitor, as for instance, with low metabolism.

Treatment of Exophthalmos.—One treats the thyrotoxicosis. The earlier this condition is treated and cured, the greater the chances that exophthalmos will subside and disappear. One should always remember that whenever ocular signs appear *early* in cases of thyrotoxic goiter, that condition, if allowed to go unchecked, will quickly become severe.

The Exophthalmometer.—In the early stages of thyrotoxicosis, exophthalmos is frequently diagnosed when in reality it is not present; at least, not yet. The presence of the Dalrymple sign, namely, retraction upward and downward of the eyelids, is responsible for the mistaken diagnosis. Measurements with

the exophthalmometer will soon determine whether exophthalmos is present or not. Measurements in excess of 18 must be regarded as abnormal, especially if there is a difference in the measurements of the two eyes.

Since patients with progressive exophthalmos are in the majority of instances hypothyroid, thyroid extract is given. To this iodine is added, the idea being that it will be helpful if thyrotoxic signs are present and, if not, will act as a deterrent to the edema of the tissues.

Cervical Sympathectomy.—Cervical sympathectomy as performed in the early days has been abandoned. The new antithyroid drugs have proved disappointing except when hyperthyroid symptoms are present.

Electrocauterization of the Hypophysis and its Stalk.— This procedure carries with it the danger of pituitary deficiency, manifested by general weakness, a very low basal metabolic rate, sexual impotence, testicular atrophy and hypoglycemia (McCullagh). However, some good results have been obtained.

Irradiation of the Pituitary.—This therapy has been found useful in a few cases, but has given totally negative results in others.

Orbital Decompression of Naffziger.—Orbital decompression consists in removing the superior orbital plate, unroofing and removing the covering plate of the optic foramen. This will permit the orbital content to move upward and, in consequence, will do away with the intraorbital forward push on the eyeball. It is mandatory to unroof the optic foramen so as to release pressure on the optic nerve. A pressure bandage over the tightly closed eyelids is necessary in order to push the eye backward.

Orbital decompression should be done only when the optic nerves show signs of being destroyed.

To Be Continued in June Issue

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Fracture Dislocation of the Acetabular Rim with Dislocation of the Hip and Traumatic Sciatic Paralysis

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INJURIES to the sciatic nerve associated with fracture dislocation of the acetabular rim may be primary or secondary. The diagnosis of primary injury to the nerve may not be made by the attending physician until several weeks after injury, when casts, traction apparatus or splints are removed and the patient attempts movement of the extremity, as demonstrated in our Case 7. Correct management of serious primary injuries to the sciatic nerve complicating fracture dislocation of the hip is important, and all such injuries should receive prompt surgical attention.

To avoid irreparable damage with permanent disability, the physician should make a thorough primary examination for evidence of involvement of peripheral nerves and apply immediate treatment. The recognition of paralysis immediately after injury will eliminate the possibility of ascribing the paralysis to pressure from callus or scar formation or to treatment. This would avoid embarrassment when the question of permanent disability, compensation or litigation occurs. Secondary injuries to the sciatic nerve are attributed to hematoma, scar and callus inclusion exerting pressure and causing eventual dysfunction of the nerve. Common peroneal paralysis is the most frequent type and may be ascribed to local pressure from casts or bandages over the upper third of the fibula. One of us (Meyerding[1]) observed stretching of the common trunk of the sciatic nerve over the sharp edge of the upward displaced fragment of the fractured acetabulum with peroneal paralysis (Case 1). Once such secondary changes have taken place, surgical measures may offer benefit (Cases 2 and 8). Time and conservative measures are the only factors that may be of benefit, thereafter. Bado and Torres-Larcebo[2] wrote:

Fracture of the cotyloid cavity at the union of its upper and middle thirds with upward and backward displacement of the head of the femur is frequently accompanied by a lesion of the sciatic nerve that clinically affects the function of the muscles innervated by its popliteal branch. This fact is of interest, inasmuch as the lesion incidentally involves the branch of the sciatic nerve as a whole. The presence of paralysis greatly delays the functional recovery of the limb area, is of considerable prognostic significance, always requiring specific treatment. From the anatomical standpoint, the fracture separates the anterior and posterior portions of the pelvic arch and includes a fracture of the posterior portion of the edges of the acetabulum that allows a backward displacement of the femur bone that appears in internal rotation.

GENERAL PRINCIPLES OF TREATMENT

Careful inquiry as to the time and nature of the accident may give valuable clues to the type of injury to be anticipated. Thus, as will be demonstrated in our reports of cases, the sudden impact in head-on collisions while the subject is in a sitting position predisposes to the type of injury under consideration. The advent of fast-moving passenger vehicles, such as automobiles and airplanes, has increased the frequency of injuries of the hip joint. Fractures of the acetabulum in older persons often result from modern transportation accidents. The hip joint of the young is vulnerable to epiphyseal separation, because the epiphyses have not been fused; after fusion of the epiphyses, severe traumatic impacts are likely to cause fractures that may involve the rim of the acetabulum.

Fracture dislocation of the hip occurs most easily when the thigh is flexed at a right angle and the femur is adducted. In this position the femoral head is held mainly by the posterior capsule. At the time of accident, in our series of cases, the thighs were not fully adducted and flexed; the femoral head was still in contact with the posterior and superior rims of

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the acetabulum, and fracture dislocation of the rim occurred. The injuries resulted from application of a powerful force through the long axis of the flexed femur. The acetabular margin was fractured, and the fragments were displaced upward and backward, presumably by the dislocated head of the femur (Case 1, Fig. 1*a*). In some instances the fragments were in the region of the sciatic notch.

Posterior dislocations usually are easily diagnosed at physical examination, on the basis of the internal rotation and adduction deformity, the presence of a palpable mass posterior to the hip joint, and shortening of the affected extremity. If seen early, they usually may be reduced by the classic method of Bigelow. Roentgenologic examination of both hips should be made, for this may disclose, as in Case 5, bilateral fracture of the acetabular rims with displaced fragments of the left rim and femoral head. Postoperative roentgenograms also should be taken, since they may show displaced fragments of the fracture of the acetabular rim that were not detected before reduction of the dislocation, as in Case 6.

In acute fractures of the acetabular rim with dislocation of the femoral head and sciatic paralysis, immediate surgical intervention is advisable. The general condition of the patient frequently will determine the extent of primary treatment. Whenever possible, reduction of the dislocation of the head of the femur should be undertaken immediately with the patient anesthetized; when this is not possible, traction applied to the affected extremity may result in reduction. After reduction of the femoral head, the acetabular fragments may be aligned, or if this cannot be done satisfactorily, they may be excised. The sciatic nerve may be found to be stretched over or even divided by the sharp edges of the displaced acetabular fragments (Case 1, Fig. 1*a*). Hematomas, if present, may be evacuated from within the nerve and surrounding structures. The sciatic nerve may be stretched, contused or partially or completely severed. Surgical intervention and end-to-end anastomosis of the severed ends of the nerve are indicated. Postoperative care probably is best carried out with the patient in a plaster-of-paris spica cast extending to the toes. When the sciatic nerve has been damaged or sutured, the cast is applied with the patient's thigh extended, the knee flexed 70 degrees, and the foot at a right angle. The patient is turned on one side or on the abdomen, and his position is changed frequently for his comfort and to prevent pressure sores. When nerve suture has been done, the cast should remain in place approximately ninety days, to prevent interference with the healing and regeneration of the nerve. After this time weight bearing with the aid of crutches should be allowed for three months. If at the end of this time there is satisfactory healing of the fracture and no degenerative changes have occurred within the femoral head, full weight bearing may be permitted. Foot-drop must be supported by means of right angle splints or splint plaster casts while the patient is recumbent and with the right angle catch brace when the patient is ambulatory.

In the presence of old or malunited fracture of the rim of the acetabulum with dislocation of the head of the femur and paralysis of the sciatic nerve, reduction of the dislocation may be extremely difficult. The bony fragments must be excised to relieve tension on the sciatic nerve or to achieve proper coaptation for end-to-end anastomosis when required. Even with the hip exposed and under direct vision, it may be impossible to accomplish reduction. In Case 1 of this series, after the head of the femur was dissected free, so much scar tissue was found that it was impossible to reduce the hip. However, with heavy skeletal traction applied postoperatively, the hip was reduced in approximately three weeks. When the foregoing measures do not produce the desired result, subtrochanteric osteotomy will permit correction of the adduction and internal rotation deformity; after maximal correction has been obtained, fixations by means of a spica plaster cast should be maintained until satisfactory union has occurred.

COMPLICATIONS

Trophic ulcers result from pressure on and paralysis of the sciatic nerve. Undue pressure or irritation, as in Cases 1 and 2, may be the inciting cause of ulcer formation. Great care should be taken to avoid this complication.

Foot-drop which persists after a year in all probability will be permanent. This deformity causes stubbing of the toes and an awkward

gait. The patient usually requires a brace to hold the foot up while he is ambulatory, or he must undergo surgical treatment for establishment of some form of permanent internal support.

Aseptic necrosis after injuries, fractures or dislocations of the hip has been reported with increasing frequency. It is a serious complication; it prolongs convalescence and increases the amount of permanent disability when it follows fracture dislocations and injuries to the sciatic nerve.

Post-traumatic arthritis may develop early and cause disability, pain, stiffness and deformity. This disabling condition also may develop slowly over several years and later require arthroplasty or arthrodesis of the hip.

REPORT OF CASES

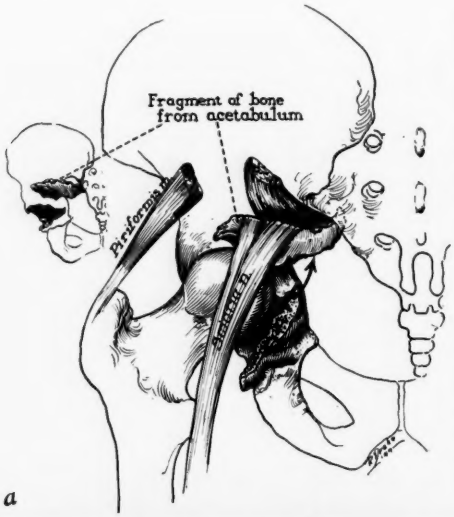
CASE 1.—*Fracture of Rim of Left Acetabulum, with Dislocation of Head of Femur and Traumatic Sciatic Paralysis and Foot Drop.*—A man 39 years old was seen on Aug. 31, 1944. He said that ten weeks prior to his admission he had fallen asleep while driving an automobile and had sustained an injury of the left hip. He had been treated for fifteen days by means of 15 pounds (6.8 Kg.) of skin traction to the left leg; then a pin had been inserted through the distal end of the femur and 16 pounds (6.8 Kg.) of skeletal traction had been applied for six weeks. The pin wounds became infected, and the pin was removed two weeks prior to his admission to the clinic. After this he had been up and about on crutches, but he said the deformity and pain in the hip with inability to dorsiflex his foot had caused him to seek further consultation.

The man was 5 feet 11¾ inches tall (182 cm.); he weighed 180 pounds (90 Kg.). The systolic blood pressure, expressed in millimeters of mercury, was 108 and the diastolic 68. The pulse rate was 80 beats per minute. The temperature was normal. The patient was disabled and in pain as he lay in bed; the left leg was partially flexed and internally rotated, with visible shortening. There were two holes in the skin above the left knee; pus was draining from the inner one. There was tenderness over the course of the left sciatic nerve and greater trochanter, with foot drop. There were recent scars on the face and arms. Roentgenograms of the left hip (Fig. 1*b*) showed upward and posterior dislocation of the left femoral head and a large fragment of bone comprising the posterior wall of the acetabulum, which had been fractured and dislocated backward and upward, with several small bony fragments.

Exploration of the sciatic nerve and reduction of the hip, with removal of bone fragments, was advised by the neurosurgical and othopedic consultants. Operation was performed on September 8. A posterior oblique incision was made over the left hip and a large fragment of bone was found to be displaced upward; the sciatic nerve was stretched over the top of it (Fig. 1*a*). The outer branch of this nerve showed marked atrophy as a result of pressure; the nerve root lay over a sharp eminence which was almost knifelike. The displaced fragment of bone was removed, releasing pressure on the nerve. The fragment was 1½ inches (3.7 cm.) wide and 1 inch (2.5 cm.) thick. The head of the femur was visible; it was caught in dense scar tissue, which was excised. It was not possible to reduce the femoral head, even when great force was employed together with bone skid. It was deemed inadvisable to continue with further surgical treatment at that time; the patient was returned to bed. Skeletal traction of 35 pounds was applied seven days later, through a Kirschner wire passed through the upper end of the tibia, after another unsuccessful manipulation. The wound in the hip had healed by primary intention. Three weeks later the patient experienced a snapping sensation. He said he could rotate the leg externally and that he had less pain. Roentgenologic examination showed the head of the femur in place in the acetabulum; the Kirschner wire was removed and a plaster-of-paris spica cast was applied which extended to the toes. The patient was dismissed from the hospital two and a half months later, and returned home. The cast was removed five months later, at which time roentgenologic examination showed that the head was reduced. The patient had about 80 per cent normal motion of the hip; foot drop was still present.

The patient returned for observation fourteen months after operation, at which time examination showed satisfactory progress. Roentgenograms (Fig. 1*c*) disclosed the femoral head in position in the acetabulum. A brace for the foot drop had been applied; and an ulcer in the calf of the leg had resulted. The patient was still walking with the aid of crutches when he was last heard from in 1948, three and a half years after his operation.

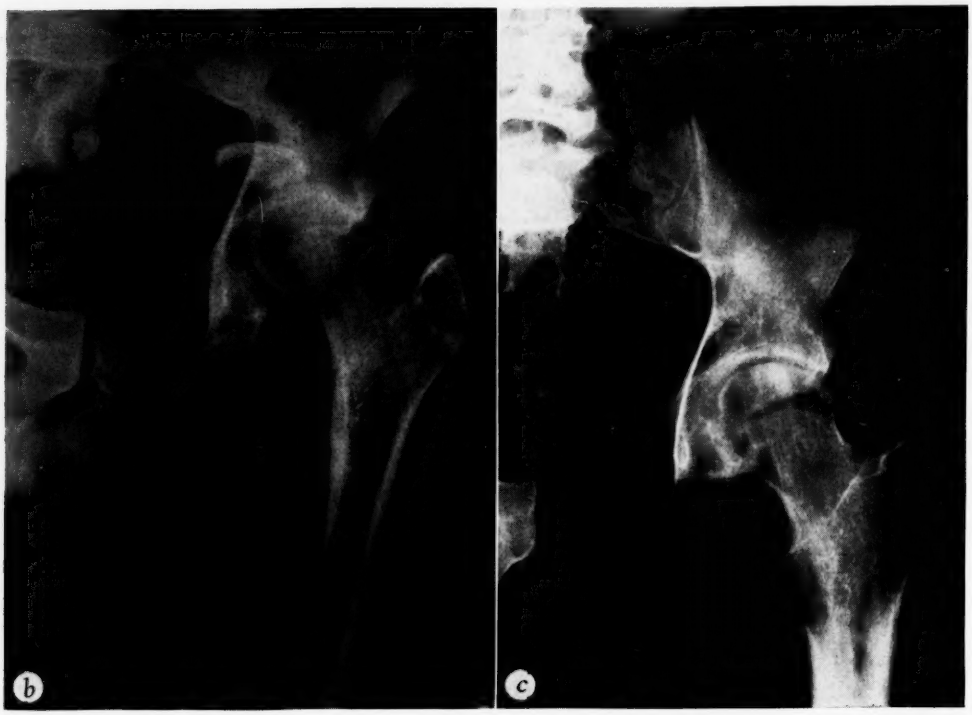
CASE 2.—*Fracture Dislocation of Posterior Rim of Left Acetabulum With Dislocation of Hip and Secondary Traumatic Paralysis of Sciatic Nerve.*—A housewife 55 years old was driving an automobile on May 29, 1947, when it left the road. She sustained multiple injuries; immediately



a

after this she was taken to a hospital, where a diagnosis was made of (1) fracture of the left clavicle, (2) fracture of the third, fourth, and fifth left ribs, (3) compound fracture of the left elbow and (4) fracture of the left hip and acetabulum. She was not unconscious. After receiving emergency treatment, she was brought 1,000 miles to the clinic, on the date of accident, within twenty-six hours by airplane, so that additional consultation and treatment could be carried out.

The dislocated hip, with fracture of the acetabulum (Fig. 2*a*), was treated by passing one Kirschner wire through the left trochanteric area and another one just above the left femoral condyle, so as to produce traction downward and laterally. Wounds of the left elbow were débrided, and the fracture involving the articular surface of the elbow was reduced and held with a Kirschner wire which was passed through from side to side and the end of the humerus impacted against the lower fragment. A cast was applied.



b c

Fig. 1.—Drawing (*a*) made at time of operation on patient in case 1, showing fracture of left acetabulum, with bone fragments displaced backward and upward, and posterior dislocation of the hip; the components of the sciatic nerve were stretched over sharp edge of displaced fragment; *b*, fracture of posterior rim of acetabulum, with posterior and upward displacement of fragment and dislocation of hip; small fragment of bone inferior to hip; this patient had primary sciatic paralysis; *c*, hip joint reduced, fourteen months after fracture dislocation.

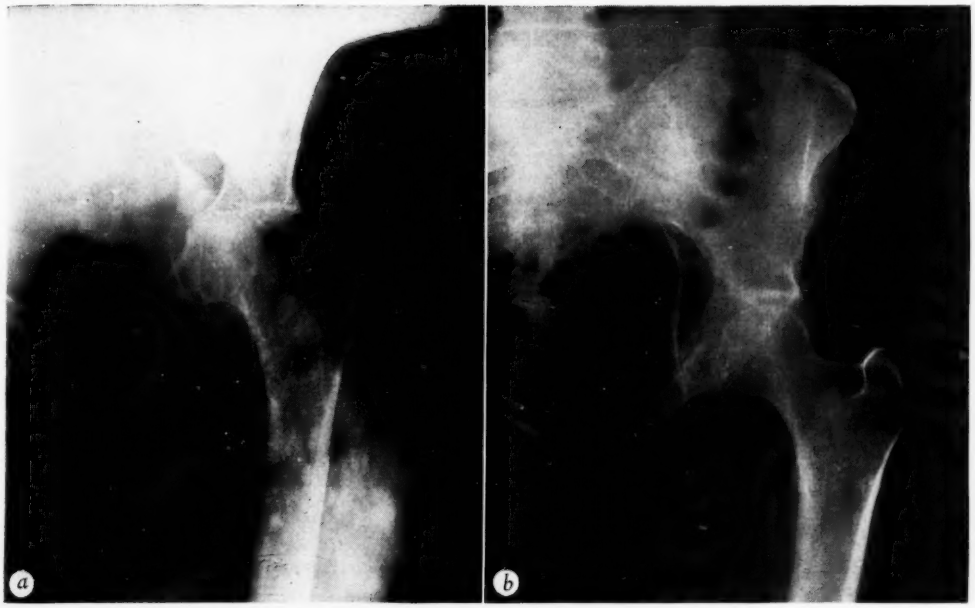


Fig. 2.—Fracture of acetabulum (*a*) with posterior medial dislocation of head of femur and also fracture of pubes and ischium in region of symphysis, in case 2; there was no primary paralysis in this case but secondary paralysis occurred postoperatively at about the tenth week; *b*, satisfactory healing of multiple fractures and reduction of dislocated hip.

Blood was transfused to the patient twice within eight days. The wires were removed from the left elbow on the fifteenth postoperative day, from the left trochanteric region of the forty-third day and from the lower end of the femur on the fifty-third postoperative day.

About the tenth week, weakness of dorsiflexion of the left foot was noticed. This weakness extended over the lower left extremity. The neurologist found paralysis to be extensive enough to warrant exploration of the sciatic nerve. On September 30, 1947, or thirteen weeks later, the left sciatic nerve was explored and found to be intact. It was freed from scar tissue through a Kocher type of incision. Examination of the site of fracture showed the bones to be firmly united.

No evidence of primary paralysis had been noticed either immediately after the accident or on arrival of the patient at the clinic twenty-six hours later. Evidence of paralysis appeared about ten weeks after the accident, secondarily.

The foot drop was treated with a plaster splint which maintained the foot at right angles.

Eleven months after the patient's injury, roentgenograms showed satisfactory position of the fragments and that the hip was reduced (Fig. 2*b*); the sciatic nerve showed gradual improvement; the legs were of equal length; rotation was about normal. There was still some degree of swelling in the anterior tibial muscles of the foot. The patient was advised to increase her activity and to receive physical therapy. Roentgenograms showed that the hip was reduced and that the fracture of the acetabulum was in good position.

CASE 3.—*Fracture of Posterior Rim of Acetabulum, With Posterior Dislocation of Right Hip and Primary Paralysis of Sciatic Nerve.*—A man 35 years old, while driving an automobile which overturned in April 1945, sustained fractures of the left ankle, the right forearm and the posterior rim of the right acetabulum, with posterior dislocation of the hip and paralysis of the sciatic nerve. He was hospitalized for seven months, during which time treatment consisted of manipulation and the use of casts. There was anesthesia of the right foot and the lateral aspect of the right leg, with foot drop. Sensation and foot drop slowly improved. At the time of his admission to the clinic, he was getting about with the aid of crutches; he come for consultation twenty-eight months after his injury because of increasing pain and disability involving the right hip.

Roentgenograms taken twenty-eight months after injury showed the right hip apparently undergoing

Fig. 3.—Roentgenograms made twenty-eight months after fracture of acetabulum, dislocation of right hip and paralysis of sciatic nerve in case 3, showing apparent aseptic necrosis, overgrowth of bone about displaced fragments and posttraumatic hyperthrophic arthritis.

aseptic necrosis, with overgrowth of bone about the displaced posterior rim of the acetabulum and posttraumatic hypertrophic arthritis (Fig. 3).

On Sept. 27, 1947, about two and a half years after the original injury, exploration of the right sciatic nerve was performed. Although the nerve was found to be somewhat thinner than normal, there was no evidence of complete severance. A vitallium cup arthroplasty was performed on the right hip at this time, after which the patient made an uneventful convalescence and returned home with improved motion and less pain, but no change in the sciatic paralysis.

CASE 4.—*Traumatic Fracture of Posterior Rim of Right Acetabulum, with Dislocation of Hip, and Traumatic Sciatic Paralysis.*—A man 31 years old was seen in September 1945, at which time he said he had been in a head-on collision in April 1942, sustaining a severe injury to the right hip. Examination and roentgenograms disclosed a fracture of the posterior rim of the right acetabulum, with dislocation of the hip and paralysis of the right sciatic nerve. With the patient under the influence of general anesthesia, the dislocation of the right hip was reduced, and a detached fragment of the acetabulum, thought to be in good position, was left in place. The patient was placed in a plaster spica cast for one month; after it had been removed he was permitted to be up and about on crutches, but was unable to dorsiflex his foot and had not been able to do so up to the time of his admission to the clinic. Two and a half years after the accident (October 1944) severe pain in the hip developed and roentgenologic examination disclosed aseptic necrosis of the head of the right femur. A walking caliper was prescribed for the patient, which he used intermittently for a year.

Three and a half years after this patient's injury, sensation had improved in the foot. We did not feel that surgical treatment was indicated at the time, and advised him to return to his physician for further care and observation.

CASE 5.—*Bilateral Fracture of Acetabulums, With Dislocation of Hips and Primary Paralysis of Right Sciatic Nerve.*—In December 1946 a man 42 years old accidentally drove his automobile into a tree and sustained numerous contusions, abrasions, lacerations of the head and neck, fracture of four ribs, Bennett's type of fracture of the right thumb and bilateral fracture of both acetabulums, with dislocation of the right hip and partial paralysis of the sciatic nerve (Fig. 4*a*).

On December 21, open reduction of the fractured thumb was performed, and the patient's legs were placed in skin traction. Four months later an attempt was made to reduce the dislocation of the left hip with the patient under the influence of anesthesia, after which the right leg was placed in traction for four weeks and the left leg for eight weeks. He was allowed to be up ten weeks after the accident, and began to walk at that time, but had considerable difficulty in doing so. Three and a half months after the accident the left hip became very painful, and he noticed a slipping sensation when he moved. He had noticed numbness of the medial aspect of the right foot and great toe, and had had no feeling in them since the accident. He came to the clinic for further advice.

On admission to the clinic in April 1947, or about four months after his accident, this patient was experiencing considerable pain in both hips, but this was more marked on the left. It had become increasingly difficult for him to get about, even with the aid of crutches. The patient's legs were equal in length, but both showed considerable muscular atrophy. The right leg was lying in internal rotation and adduction; the hip could be flexed to 90 degrees and abducted to 30 degrees; it could not be externally rotated or extended past 180 degrees. The left leg was lying in external rotation

Fig. 4.—Bilaterally fractured acetabulums (*a*) with dislocations of femoral heads in case 5; fragments of fractured acetabulums appear displaced; *b*, roentgenogram made nine and a half months after injury, showing atrophy in head of right femur with narrowing of joint space; the left hip shows absorption and deformity of femoral head; greater trochanter is displaced upward and inward; large bone fragment apparently in undergoing atrophy and becoming united; bones of pelvis and femurs have undergone some atrophy and aseptic necrosis is occurring in both hips: *c*, roentgenogram made two years after injury; right femoral head has undergone aseptic necrotic changes sufficient to cause deformity and absorption and appears displaced farther in enlarged acetabulum, with adduction deformity; left hip shows further loss of joint interspace; trochanter is slightly more upwardly displaced; large fractured fragment appears united; all bones about hips appear less atrophic.

and could not be internally rotated or flexed because of pain and muscular spasms. When forced, flexion of 70 degrees and abduction of 30 degrees were obtained in the hip. All superficial and deep reflexes were exaggerated, and there was loss of tactile sensation of the medial aspect of the right foot and great toe, but no foot drop. The diagnosis at this time was fracture of the right acetabulum; fracture of the left acetabulum, with upward and posterior dislocation of the fragment; Bennett's fracture of the right thumb, fracture of ribs on the left, and multiple lacerations of the head and face (Fig. 4*b*).

This patient was examined again about two years after injury. The aseptic necrosis of the hips was progressing, and further post-traumatic arthritic changes could be expected (Fig. 4*c*). The patient managed to continue his work; surgical treatment was not given. He was advised to return later for further consideration.

CASE 6.—*Primary Sciatic Paralysis With Fracture of Posterior Rim of Right Acetabulum, Displacement of the Fragment and Dislocation of Hip.*—A man 52 years old fell asleep while driving his automobile on Aug. 20, 1947. He ran into a telephone pole in front of a hospital. He received immediate attention for the fracture of the posterior rim of the right acetabulum, with upward displacement of the fragment, fracture dislocation of the head of the femur and primary right sciatic paralysis. With the patient under the influence of pentothal sodium anesthesia, the hip had been reduced and a Thomas splint with Pearson attachment had been applied. When we saw him he had numbness and right foot drop, for which he required a brace. Roentgenograms disclosed bone masses about the lateral and posterior surfaces of the right hip resulting from old fractured fragments with malunion. The left hip appeared to be normal (April 13, 1948). Spondylitis with lipping appeared in the lumbar part of the spinal column.

Comment on Case 6.—Although this patient came to us in April 1948 because of pain and stiffness of the right hip and along the sciatic nerve, he admitted that he was improving and that he was able to walk much longer distances than before. He was advised to continue with conservative measures and to report in about twelve months for reexamination and reconsideration of his condition (Fig. 5), at which time he did not have the severe causalgic pains which he previously had; he performed at least 75 per cent of his duties, and his morale was better than it had been. He still had complete paralysis of the anterior tibial group of muscles and almost complete paralysis of the peroneal group, but all other muscles were working well.

CASE 7.—*Old Fracture Dislocation of Left Hip and Malunion of Fractured Acetabulum, With Traumatic Sciatic Neuritis.*—A man 50 years old was seen seven and a half months after injury in a head-on automobile collision on Nov. 17, 1947. At the time of the accident the head of the left femur had been driven backward, fracturing the acetabulum and producing dislocation. The patient did not know whether foot drop occurred instantly or developed later; four weeks after manipulation and traction he found that he was unable to move the foot upward and he also noticed numbness of the

Fig. 5.—Resulting bone masses formed about posterolateral borders of the right hip after fracture of acetabulum in case 6, with displaced bone fragments, after fracture dislocation.

foot, mostly about the great toe. He did not notice any sensory changes immediately after the accident.

At the time of examination at the Mayo Clinic, the patient walked with a left limp and had about 40 degrees of flexion deformity of the left hip. He did not complain of pain. Roentgenograms of the left hip showed displacement of the femoral head upward about 1 inch (2.5 cm.), with malunion of fragments of the acetabulum, sclerosis of the ilium, ischium and pubic bone which looked like the condition seen in Paget's disease, and spondylitis with lipping in the lumbar part of the spinal column. He continued to receive conservative treatment.

CASE 8.*—*Old Fracture of Left Acetabulum With Posterior Displacement of Femoral Head Complicated by Injury to Left Sciatic Nerve.*—On June 7, 1934 a lineman 31 years old, while on a 30-foot (9 M.) telephone pole, fell to the ground, landing on his left foot and left knee. He was immediately disabled but did not become unconscious. He was hospitalized immediately. Roentgenograms were made which, he was told, showed dislocation of the left elbow and an impacted fracture of the head of the left femur. With the patient under the influence of anesthesia the fractured elbow was reduced, and the fracture of the hip was treated conservatively. The patient came to the Mayo Clinic eight months later, using a crutch. He said that after his injury he had noted immediate inability to move the left foot, with numbness over the lateral aspect of the leg, foot and posterior aspect of the thigh. He added that there had been some diminution of the area of numbness. He had been unable to abduct the left thigh for some months, although during the two months just prior to his admission this condition had improved. After six weeks in the hospital, he had been permitted to return home by ambulance; he remained in bed there for four weeks. He had pain in the left buttock which was steady and dull, but not lancinating. Ten weeks from the time of the accident, he was able to be up with the aid of crutches. At this time his physician told him that the left sciatic nerve was injured; he received massage treatment. After further consultation, the making of roentgenograms and treatments were discontinued, and the patient was advised to seek further examination and opinion at the clinic.

Examination disclosed some degree of atrophy of the left thigh, and ½-inch (1.2 cm.) shortening of the left leg. Flexion and adduction of the hip appeared to be normal, but there was limitation of abduction and circumduction. A firm mass was palpable in the left buttock; this mass was attached to the fragment of bone which was pressing on the damaged sciatic nerve. Roentgenograms showed the fracture of the left acetabulum involving the posterior superior margin, the fragment being displaced upward.

There was paralysis of the left leg, with foot drop. This patient was seen in consultation by a neurologist, neuro-surgeon and orthopedic surgeon, who advised that the fragment of bone be removed because it was causing pressure on the sciatic nerve near the sciatic notch. Woltman[3] has illustrated by charts and photographs the progressive improvement of the sciatic and posterior cutaneous nerves after surgical removal of the fragment of bone in this case by one of us (Meyerding).

There was evidence of left traumatic sciatic palsy, with anesthesia of the entire left foot; also some limitation of motion in the elbow, an impaction fracture of the left sacroiliac joint, and spondylitis with lipping of vertebral bodies of the spinal column.

On March 8, 1935, through a gluteal muscle-splitting incision, the sciatic nerve was exposed and displaced. The fragment of the acetabulum was found to have been pushed upward under the sciatic nerve. The fragment of bone was removed and the sciatic nerve was dissected free. Transplantation of a pedicle flap of muscle underneath the nerve was performed. The sheath was not ruptured and the nerve did not appear to be severed.

Comparison of Figure 6*a* with 6*b* and 6*c*, representing the same patient and made two years and three months after removal of the fragment of bone, shows that there was marked improvement in the areas of sensory loss; furthermore, the muscles had recovered about half their power.

*Roentgenograms not available in this case.

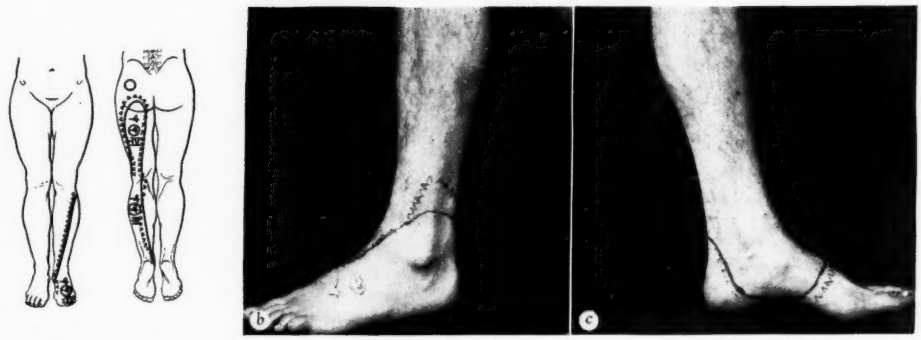


Fig. 6.—Injury to left sciatic and posterior femoral cutaneous nerves (*a*) shown in diagrams drawn eight months after injury in case 8; there analgesia was noted below line of arrows and anesthesia below solid line; circle on left buttock designates site of mass of scar tissue and fragment of bone which was pressing on sciatic nerve; this fragment was removed. Symbols on drawing and photographs have the following significance: Zero, normal; –4 or –IV, complete loss; arabic numerals not encircled, tactile sensation; arabic numerals encircled, pain sensation; roman numerals not encircled, temperature. Lateral (*b*) and medial (*c*) photographs of left leg, showing lines bounding sensory loss two years and three months after removal of bone fragments. Status of motor as well as sensory nerves had improved.

In September 1943, eight years after injury, the patient was much improved and able to carry on without difficulty his daily work at a government ordnance plant, was driving 84 miles each day.

SUMMARY AND CONCLUSION

Modern transportation accidents cause an increasing number of fractures of the acetabulum, with dislocation of the femoral heads. The sciatic nerve may be seriously damaged at the time of the accident or later. Careful examination before treatment is advisable in order to establish the cause and time of occurrence of paralysis. When fracture dislocation has taken place with immediate evidence of paralysis, the damaged hip should be reduced, fragments of bone replaced or excised, and the sciatic nerve explored. Pressure or injuries to the sciatic nerve cause paralysis, which may be recognized as soon as the patient's condition permits thorough examination. Prompt surgical treatment of serious primary sciatic paralysis complicating fracture of the acetabulums and dislocation of the femoral head is advisable. Secondary sciatic paralysis may result from treatment, hematoma, pressure of scar or callus.

RÉSUMÉ

Le taux actuel des accidents de circulation cause un nombre de plus en plus élevé de fractures de l'acétabulum accompagné de luxation de la tête du fémur. Le nerf sciatique peut être sérieusement endommagé au moment de l'accident ou plus tard. On conseille l'examen consciencieux avant d'entreprendre le traitement afin de déterminer la cause et le moment de début de la paralysie. Lorsque la fracture-luxation se produit avec symptômes immédiats de paralysie, la hanche luxée sera remise en place, les fragments osseux rétablis ou excisés et le sciatique examiné. La paralysie peut être causée par des lésions ou par la pression sur le nerf, ce que l'on doit déterminer dès que l'état du malade permet un examen détaillé. L'auteur conseille l'intervention chirurgicale précoce de toute paralysie sciatique primaire sérieuse compliquant la fracture de l'acétabulum avec luxation de la tête du fémur. La paralysie secondaire peut être le résultat du traitement lui-même, de l'hématome, de la pression cicatricielle ou du cal osseux.

RESUMEN

Los accidentes de transporte modernos causan un número creciente de fracturas del acetabulum con luxación de la cabeza del fémur. En el momento del accidente, o más tarde, puede lesionarse gravemente el nervio ciático. Es aconsejable practicar un examen cuidadoso antes del tratamiento para establecer las causas y momento en que se presentó la parálisis. Cuando se ha producido una luxa-

ción con fractura y con signos inmediatos de parálisis, debe reducirse la articulación de la cadera lesionada y volver a colocar en su posición los fragmentos de huesos desplazados, o bien practicar la extirpación de los mismos y explorar el nervio ciático. La presión y las lesiones en el nervio ciático causan parálisis que pueden descubrirse en cuanto el estado del paciente permite un examen minucioso. El tratamiento quirúrgico rápido de la parálisis primaria grave del nervio ciático complicante de la ruptura del acetabulum y luxación de la cabeza del fémur es aconsejable. Puedo resultar una parálisis ciática secundaria del tratamiento, hematoma, presión presión de la cicatriz o callo cicatricial.

RIASSUNTO

Gli incidenti dovuti ai moderni mezzi di trasporto hanno aumentato il nemero delle fratture dell'acetabolo, con dislocazione della testa femorale e con lesioni immediate o secondarie, da pressione, del nervo sciatico. S'impone quindi un esame accurato prima di ogni intervento onde accertare la causa ed il tempo d'insorgenza della paralisi. Se i sintomi della paralisi risalgono al momento stesso dell'incidente, la frattura va ridotta, i frammenti ossei debbono essere sostituiti o asportati, le condizioni del nervo sciatico vanno indagate.

L'A. consiglia un pronto intervento operativo se una paralisi primaria, grave, dello sciatico complifa una frattura dell'acetabolo ed una dislocazione della testa femorale. Una paralisi secondaria dello sciatico puo' risultare dalle manovre stesse di riduzione, da ematomi, dalla pressione esercitata da cicatrici o da calli ossei.

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Listen to Reason!

Reason is the mistress and queen of all things.—*Cicero*

Error of opinion may be tolerated where reason is left free to combat it.—*Jefferson*

Every why hath a wherefore.—*Shakespeare*

Many are destined to reason wrongly; others, not to reason at all; and others, to persecute those who do reason.—*Voltaire*

All generalizations are dangerous, even this one.—*Dumas*

Local Causes of Mortality and Early Morbidity in Gastroduodenal Resection for Peptic Ulcer

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WHILE there is no scarcity of papers evaluating the final results of gastroduodenal resection for peptic ulcer, very little, particularly in recent years, has been reported on the early mortality and morbidity associated with the operation.

On the other hand, the wide acceptance of vagotomy among surgeons cannot be explained by its superior results, because a follow-up of vagotomized patients does not justify the popularity of the operation. One is led to assume that the low mortality associated with vagotomy may be the main reason for this enthusiasm, since apparently gastroduodenal resection still has a considerable fatality rate.

References to mortality figures are often missing from the periodic reports of departments interested in the surgical treatment of peptic ulcer. To be sure, the value of any surgival procedure must be measured by its clinical results. However, silently passing over the immediate mortality connected with a method is far from giving a true picture of its results; moreover, an important incentive to technical improvement is missed if the question of operative mortality either is not discussed at all or is dismissed with the statement that problems of technic are unimportant. Indeed, there is no surgeon—experienced or otherwise—who will not benefit from an honest examination of the immediate results of his activity in intestinal resection.

Better understanding of preoperative, operative, and postoperative care, advances in anesthesiology, and the use of antibiotics and anticoagulants have largely eliminated fatalities due to complications other than those occurring in the operative field. Today it is fair to assume that mortality following gastroduodenal resection is caused:

1. By separation of the duodenal stump.
2. By accidental lesions of the common duct and the pancreas.
3. By obstruction of anastomoses.
4. By postoperative hemorrhage.

1. *Separation of the Duodenal Stump.*—If pylorus and duodenum are not involved in the inflammatory process, classic inversion of the duodenal stump is fully reliable, provided that the posterior wall is mobilized to an adequate extent to avoid undue tension of the inverting sutures.

However, separation of a well closed stump can be effected by back pressure of duodenal content. A prerequisite of increased duodenal pressure is obstruction of the afferent jejunal loop at the gastrojejunal anastomosis. In this case it is evident that permanent suction drainage of the stomach cannot prevent duodenal retention. In the postoperative course, signs and symptoms of duodenal distention are similar to those of acute cholecystitis. Absence of bile in the aspirated stomach content is an additional indication. If there are increasing signs of localized peritonitis, a second laparotomy becomes imperative, though no mention of this indication for revision is made in the ample literature on the surgical treatment of peptic ulcer. The particular procedure to be performed in these cases is needle aspiration of the duodenal content and enteroanastomosis, provided that the afferent loop is long enough to permit anastomosis. If "no loop" retrocolic anastomosis was done at the first operation, decompression of the duodenum can be effected by duodenojejunostomy. The anterior wall of the duodenum is connected with an upper jejunal loop by side-to-side anastomosis.

Duodenal obstruction may also follow an end-to-end anastomosis at the duodenojejunal junction as performed in the course of radical operation for marginal ulcer. The following case history illustrates this condition.

A 52-year-old male patient was admitted to the hospital with the diagnosis of marginal ulcer. He had previously undergone a retrocolic "no loop" gastroenterostomy for duodenal ulcer and, two years later, an excision of the pylorus and part of the antrum, because of the "unsatisfactory result" of the gastroenterostomy. At operation a

large penetrating marginal ulcer was observed. The greater part of the remaining stomach and the jejunal loop was resected. Transection of the proximal partion of the jejunum was carried out at the duodenojejunal junction. The third part of the duodenum had to be mobilized according to Clairmont's technic in order to perform an end-to-end duodenojejunostomy. Although a one-layer suture was used, the diameter of the anastomosis was rather small. An end-to-side gastroenterostomy (Hofmeister-Polya type) was added.

The patient's pulse and temperature rose on the fifth postoperative day; he complained of sharp and spasmodic pains in the right upper quadrant of the abdomen, where rebound tenderness was present. As this tenderness increased in scope and intensity and no bile could be aspirated through the Levine tube, obstruction of the duodenojejunostomy was suspected. A second laparotomy showed the duodenal stump to be tremendously distended; there was a moderate amount of biliary exudate around it, though no separation could be demonstrated. About 500 cc. of duodenal content was removed by needle aspiration. The patient's poor condition did not permit an extensive procedure. The duodenum was incised and a catheter introduced. The immediate result was satisfactory. Temperature and pulse went back to normal. The daily amount of duodenal juice sucked off through the catheter left no doubt that the duodenal fistula was complete. In a short time the skin around the incision became excoriated because of the digestive property of pancreatic juice. Ten days later a third operation was performed: A jejunal loop was brought up retrocolically, an anstomosis with the duodenal opening effected, and a jejunojejunostomy added. Four weeks later, however, an incomplete intestinal obstruction made another laporotomy necessary. A loop of the lower part of the ileum was adherent and strangulated at the incision of the mesocolon. The loop was freed and an enteroanastomosis performed. The subsequent course was uneventful. The patient gained 15 pounds (6.8 Kg.) in a short time. He has been in perfect health for over a year.

Though separation of the duodenal stump because of back pressure is accompanied by prodromal symptoms of some days' duration, the clinical picture is, as a rule, more acute in cases in which inadequacies of suture technic or of the blood supply of the stump are responsible. This event manifests itself in much the same way that a ruptured duodenal ulcer does, and it is only logical to apply a similar treatment: namely, immediate laparotomy. From the time before present rules for handling the duodenal stump in cases of deep-seated duodenal ulcer were not yet established, I remember a number of cases in which immediate revision probably saved the patient's life. In fact, one of these cases gave the reason to modify the duodenal closure along the lines now used for about twenty years.[1c]

A middle-aged patient was operated upon for penetrating ulcer of the posterior wall of the duodenum. Gastroduodenal resection was performed. Although the ulcer crater (in the pancreas) was left in situ, the posterior wall of the duodenum distal to the ulcer was separated from the head of the pancreas in order to permit use of the classic method of inversion of the stump. The sutures uniting the anterior and posterior walls of the duodenum were not under undue tension. Thirty hours later, acute peritonitis developed in the upper part of the abdomen, and the diagnosis of separation of the duodenal stump was made. Immediate revision was decided upon. A large amount of biliary fluid was observed in the subphrenic space and around the duodenal stump. There was almost complete necrosis of the inverted posterior wall, with a dime-sized perforation in the center. A heavy rubber tube was introduced into the duodenal opening and epiploon wrapped around the tube. The postoperative course was satisfactory. There was a profuse flow of bile and pancreatic juice through the tube for about seven days. The tube was then removed; external duodenal drainage ceased on the fourteenth day.

The following conclusions can be drawn from this case and similar ones:

1. Separation of the duodenal stump should be treated in exactly the same way as any primary intestinal rupture— by immediate laparotomy.
2. In cases of penetrating ulcer the blood supply of the posterior wall of the duodenum is, to a larger than normal extent, taken over by highly vascularized adhesions between the capsule of the pancreas and the duodenum. In dissecting out the posterior wall these vessels have to be ligated, which invites the danger of partial necrosis.

Moreover, exposure of the posterior wall, though unnecessary, is a rather tedious and— in view of the proximity of the common duct and the pancreas—a hazardous procedure. It was for this reason that a modified duodenal closure was recommended (1932) which dis-

pensed with mobilization of the posterior wall and used only the anterior wall for covering the stump.[1a] Statistics give proof of the value of this method.

Up to 1931, the postoperative mortality rate for gastroduodenal resection for duodenal ulcer was about 8 per cent.[1b] From 1932 to 1936 this rate (in a total of 259 cases) was 3.08 per cent.[1c] From January, 1941 to January 24, 1950, the same statistic in 173 cases was 0.6 per cent.

The first decrease in mortality must have have been brought about by the modified technic; the second was probably due to better anesthesia and the liberal use of blood transfusions and antibiotics.

In the period from 1941 to 1950, which corresponds to the author's surgical practice in New York, no duodenal ulcer was encountered which could not be resected by the method described. There were two penetrating ulcers of the second and third portion respectively, which at operation proved to be cancerous. In both instances a history of duodenal ulcer of many years' duration was given. In the first case (second portion) a Whipple type of resection was performed. The patient had an uneventful recovery. In the second case (third portion) the diagnosis of cancer was not definitely established during the operation. An exclusion-resection of the first part of the duodenum and three quarters of the stomach—was performed. The patient returned one year later with evidence of diffuse peritoneal carcinomatosis, to which he succumbed.

The only postoperative fatality was the death of a 45-year-old woman with penetrating ulcer of the posterior wall of the duodenum. On resection no difficulties were encountered. The patient died on the ninth postoperative day from thrombosis of the superior mesenteric and portal veins, for which no mechanical cause could be found.

It may be mentioned that the oldest patient was 87 years of age. Involvement of the pylorus in a mass of tumorlike appearance suggested carcinoma, though subsequent histologic examination revealed ulcer with considerable collateral edema. She made a perfect recovery.

The combination of duodenal ulcer with prepyloric carcinoma occurred in a patient with an ulcer history of thirty years' duration.

In another case the first part of the duodenum was transformed into a narrow and rigid pipe owing to ulceration of the posterior wall and scar formation of the anterior one. This was the only case in which Finsterer's exclusion-resection might have been considered. I felt, however, that the existing stenosis would hamper drainage of the remaining prepyloric pouch. Since the anterior wall was not pliable enough for inversion, the first jejunal loop was anastomized side-to-end to the duodenal stump, as described some years ago.[1c]

2. *Accidental Lesions of Pancreas and Common Duct.*—Injuries of pancreatic parenchyma are unpredictable in their consequences. They may heal without any complications; they may lead to effusion of pancreatic juice with subsequent peritonitis; they may be followed by acute pancreatitis. It is therefore the wisest policy to avoid incision of pancreatic tissue if possible. In resection the ulcer crater in the pancreas should be left untouched after the gastric or duodenal wall has been separated from the brim of the crater. Leaving the crater in situ is a fairly good protection against complications unless an eroded accessory pancreatic duct is present in the depth of the ulcer. This can be recognized by effusion of pancreatic juice and proved by probing of the duct. Then the technic of closure requires a modification, in order to prevent accumulation of pancreatic juice between the two suture lines, which may lead to arrosion and separation. Adequate drainage can be procured by leaving out the first row of sutures; thus drainage into the duodenum is assured.[1c]

Injuries of the common duct can be safely prevented in ulcers of the posterior wall by our method of closure. If the penetration involves also the hepatoduodenal ligament, excision of the ulcer crater will endanger the common duct. It is here likewise the best tactic to leave the crater intact. Exposure of the common duct and introduction of a T-tube, as recommended by Lahey, will serve the purpose of protecting the duct, although in the last series of 173 cases I never found it necessary to apply this protective measure.

External drainage of the operative field has been a matter of routine in cases in which an ulcer crater was left in situ or in which pancreatic parenchyma was exposed. Although in the reported series no pancreatic biliary or duodenal drainage was encountered, I was impressed by the large amount of serosanguineous fluid expelled through the drain in the first postoperative days. Since 1933 practically

every gastroduodenal resection wound has been drained; it was the same consideration that induced Wangensteen, as he reported in a recent paper, to favor postoperative drainage.[2]

3. *Obstruction of the Anastomosis.*—Wangensteen[2] has drawn attention to the fact that obstruction is much more frequent at the corner points of the anastomosis than at its center. His technic assures adequate patency at the critical spot. There are, however, cases of obstruction in which mechanical conditions seem to be satisfactory if checked after termination of the anastomosis. This happens much more frequently in patients on whom the resection was performed for peptic ulcer rather than for malignant disease. As a tendency to intestinal spasm is one of the outstanding features of the ulcer diathesis, one gains the impression that obstructive symptoms in the beginning are caused by a combination of spastic and mechanical factors, the latter becoming more and more prevalent in an advanced stage of the condition.

In the early stages, large doses of atropine may be helpful. While it is possible to overcome the nutritional difficulties by parenteral feeding for a long period, a repeated laparotomy should not be delayed when after six or seven days no signs of patency of the anastomosis are evident. Leaving the Levine tube in situ for more than one week may lead to decubital ulcers of the esophagus and—particularly in elderly patients—to bronchopneumonic complications. Since the point of obstruction as a rule is at the junction of the gastric stoma and the efferent jejunal loop, an additional gastroenterostomy is the procedure of choice. Not much is gained by inspecting the original gastroenterostomy or by trying to correct the mechanical conditions in this area. We prefer to enter the upper part of the abdomen through a separate left pararectal incision; the efferent jejunal loop is grasped and, in using a long afferent loop, a new anastomosis with the anterior wall of the stomach is performed. A short circuiting jejunojejunostomy between the afferent and the efferent loop is added.

4. *Postoperative Hemorrhage.*—The two main reasons for intrinsic hemorrhage subsequent to gastric resection are: (1) transected vessels at the anastomosis, and (2) hemorrhagic gastritis.

In the latter case the loss of blood seldom reaches dangerous proportions. Moreover, this cause of postoperative hemorrhage is extremely rare and cannot be determined with certainty. It is the best policy to assume that persistent and rapid postoperative hemorrhage is due to one or several bleeding vessels at the anastomosis, and to act accordingly. This does not mean operative hemostasis in every case. In the majority of cases continuous blood transfusion will carry the patient over the critical time until spontaneous closure of the bleeding vessel has taken place.

There is, however, an occasional case in which spontaneous hemostasis fails to occur. A repeated laparotomy becomes imperative. The least time-consuming procedure is the best. Undoing of the anastomosis would necessitate its restoration after hemostasis has been effected. This takes considerable time. The operation can be shortened considerably by doing the necessary work through a gastrotomy: An adequate incision is made in the anterior wall of the stomach parallel and to a distance of 1 inch (2.5 cm.) to the anastomosis. Then the surgeon's left hand pushes the anastomotic ring into the gastrotomy incision; bleeding vessels are clamped from within and ligated.

If only diffuse oozing is encountered, a continuous stitch of atraumatic chromic catgut will accomplish the necessary hemostasis. The anastomosis is then permitted to slip back, and the gastrotomy opening is closed in two layers.

To be sure, this unpleasant complication can be fairly well prevented by careful hemostasis during the resection. As routine, we use von Haberer's suture ligatures of the submucosa of the stomach and make sure that spouting vessels of the submucosa of the jejunum are properly ligated. Since these precautions were adopted only one massive postoperative hemorrhage has been encountered.

SUMMARY AND CONCLUSIONS

Local complications following gastroduodenal resection for peptic ulcer are discussed with regard to prevention as well as treatment.

Indications for early repetition of laparotomy are outlined.

The article is submitted as a contribution to a chapter on operative surgery, which is so ably presented in M. Thorek's book "Surgical Errors and Safeguards."

RÉSUMÉ

Les complications locales suivant la résection gastroduodénale pour l'ulcère peptique sont discutées du point de vue de la prévention aussi bien que du traitement. L'auteur présente un sommaire des signes qui exigent la laparotomie précoce.

Cet article est présenté comme contribution à un chapitre sur la chirurgie opératoire, admirablement mise au point dans le livre de Max Thorek intitulé "Erreurs et Précautions Chirurgicales" ("Surgical Errors and Safeguards").

RIASSUNTO

Discute le complicazioni locali successive a resezione gastro-duodenale per ulcera peptica, delineando sia i mezzi per prevenirle, sia i metodi di cura. Espone le indicazioni per una precoce ripetizione della laparatomia.

L'articolo e' dedicato ad un capitolo della chirurgia operativa, che e' cosi abilmente trattata da M. Thorek nel suo libro "Surgical Errors and Safeguards."

RESUMEN

Se estudian las complicaciones locales que se presentan a continuación de la resección gastroduodenal para tratar una úlcera péptica en cuanto a su prevención y su tratamiento, esbozándose las indicaciones de la repetición precoz de una laparotomía.

El artículo se presenta como una contribución a un capítulo de la cirugía operatoria que tan competentemente ha sido expuesta en el libro del Dr. M. Thorek, titulado "Surgical Errors and Safeguards."

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The Good Old Days

Lavoisier, under sentence of death by the French Revolutionary Tribunal on the grounds that "la Republique n'a pas besoin de savants" ("The Republic has no need of scientists") was still so much more interested in science than in his own fate that he begged for postponement of the execution that he might see the results of experiments in hand. This favor, of course, was denied him. "It took but an instant to cut off his head," said one of his friends to another, "but a hundred years will not produce one like it."

Sir James Mackenzie, of whom it was said that he mended men's hearts faster than Cupid could break them, was denied existence itself by his jealous contemporaries. A group of German doctors once made pilgrimage to see and honor him; on asking direction from a group of famous heart specialists in London they were told flatly, "There is no such person."

Intravenous Sodium Dehydrocholate in Treatment of Hepatic Duct Stones

Report of a Case and Review of the Literature

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GALLSTONES remaining or forming in the bile ducts are a relatively common cause of unsatisfactory results following operations on the biliary tract. In 1938, Best and Hicken[1] reported a nonoperative method of removing such calculi. These workers concluded that the increased flow of a thin, watery bile resulting from administration of hydrocholeretics would produce an irrigating effect on the biliary duct system. Best has since reported further excellent studies on the control of bile flow and the successful washing out of remaining calculi.[2]

The case herein reported is one of erroneous operative diagnosis of carcinoma of the ampulla of Vater, followed eight years later by cholecystectomy and choledocholithotomy. Cholangiographic studies after the second operation revealed stones in the hepatic duct. Removal of these stones was facilitated by biliary flush with intravenous sodium dehydrocholate.

Best has used a three-day flush with oral dehydrocholic acid and antispasmodics. Atropine and nitroglycerine are used to relax the sphincter of Oddi. Our studies[3] and the studies of Ivy and his associates[4] show that intravenous administration produces a more profound stimulation of bile flow than does oral administration. The main problem in our case was moving the hepatic duct stones out of the liver. We therefore decided to use a combination of oral dehydrocholic acid and intravenous sodium dehydrocholate, in order to produce the greatest possible increase in flow of thin, watery bile. Antispasmodics were not used, for there was no spasm of the sphincter of Oddi and the stones were not lodged in this location. In addition, the patient experienced no colic during the period when five small stones passed into the duodenum.

From a review of the literature and from our own clinical studies, we agree with Best that bile acids will produce a biliary flush. There has been no previous case reported of the successful use of hydrocholeretics in the removal of hepatic stones. We have been unable to find a previous report on the use of intravenous sodium dehydrocholate in the removal of stones from the biliary and hepatic ducts.

REPORT OF CASE

A 46-year-old Negress was admitted to the Cook County Hospital in February 1941 because of jaundice of three months' duration. The patient stated that she had had frequent episodes of nausea and flatulence during the preceding four months. She had noted no abdominal colic but had some dull, inconstant epigastric discomfort. She had lost 25 pounds (11.3 Kg.) in weight during this period. Her jaundice was gradually progressive in development and was nonremitting; dark urine and clay-colored stools were of constant occurrence. Physical examination at this time revealed a deeply jaundiced patient with a non-tender, firm liver margin palpable 3 cm. below the right costal margin in the midclavicular line. Examinations of the urine repeatedly gave negative results for urobilinogen and strongly positive results for bile. The stools at all times were acholic. Occult blood was present in several stool specimens. Fifteen days after admission an exploratory laparotomy

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was performed. The surgical report of this procedure states that the liver, pancreas, and common duct appeared normal. The gallbladder was dilated but otherwise normal in appearance and was filled with thick, green bile. A diagnosis of carcinoma of the ampulla of Vater was made, and a cholecystogastrostomy was performed. A liver biopsy specimen at this time revealed minimal biliary cirrhosis. The patient's postoperative course was uncomplicated, and she was discharged three weeks after the operation.

After her discharge from the hospital, she remained free from jaundice but had frequent episodes of nausea and flatulence. There was a definite intolerance to fatty foods, the eating of which resulted in attacks of pain in the right upper abdominal quadrant, which at times were accompanied by emesis. When she remained on a bland diet, she was asymptomatic. No icterus was noted by the patient during this period.

In January 1949 the patient had several attacks of severe colic in the right upper quadrant, with chills, fever, and emesis. After the third of these attacks she noted a faint yellow color in her sclera and, several days later, generalized icterus. The icterus was constant, the urine dark and the stool clay-colored at all times. There was a 10-pound (4.5 Kg.) loss of weight in three weeks, due to dietary restriction. During this period, the patient was not seen by a physician until July 1949, when she was admitted to a medical service at the Cook County Hospital and later transferred to our surgical service.

Physical examination on July 30 revealed a well-developed, colored female in no acute distress, but showing evidence of recent loss of weight. Temperature, pulse, and respirations were normal. The blood pressure was 140 systolic and 80 diastolic. Generalized, marked icterus was present, and a firm, non-tender liver margin was palpable 1.5 cm. below the right costal margin in the midclavicular line. Initial laboratory studies disclosed the following: a hemoglobin value of 66 per cent. The blood count revealed 3,790,000 red cells (many of which were macrocytic and hypochromic) and 7,200 white cells per cubic millimeter, with a normal differential count. The Kahn test and a scout film of the abdomen revealed no abnormality. Chemical studies of the blood are shown in the accompanying table. The urine was free of albumin and sugar, and microscopic examinations gave negative results. The values for nonprotein nitrogen and for creatinine were within normal limits. Repeated examinations of urine specimens over a ten-day period revealed positive results for bile, but no urobilinogen could be observed even after precipitation of the bile with calcium chloride. The stools appeared acholic at all times and contained no occult blood.

Clinically, jaundice was a persistent observation. On August 6 a double-lumened tube with a distal weighted balloon was passed into the stomach and duodenum. (This tube is so constructed that the proximal end aspirates the stomach while the distal end is located near the ligament of Treitz; thus it is possible to collect duodenal contents uncontaminated by gastric juice). Aspiration for three hours failed to reveal the presence of bile in the gastric secretions, which contained free acid. Secretions obtained from the duodenum were much less in volume than the average value that we have obtained with normal persons.[3] These specimens were bile stained, and microscopic study revealed numerous pus cells. A secretin test showed normal volume and bicarbonate responses indicating normal pancreatic function. After this procedure it was concluded that the cholecystogastrostomy performed in 1941 was occluded and that there was an incomplete obstruction of the common bile duct with cholangitis.

The patient was prepared for operation with thiamine, niacin, vitamin K, a high protein and high carbohydrate diet, and penicillin. Further

Fig. 1.—Postoperative cholangiogram. Large stone in left hepatic duct; five small stones in branch of right hepatic duct.

Chemical Hematologic Data in Case Reported

	Total protein, Gm./100 cc.	Albumin, Gm./100 cc.	Globulin, Gm./100 cc.	Total cholesterol, mg./100 cc.	Alkaline phosphatase, units	Icteric index, units	Thymol turbidity, units	Gamma turbidity, units
July 30	7.4	3.5	3.9	350	24.0	61	11.6	14.2
August 3	8.4	4.4	4.0		30.5	31	18.4	16.1
August 8	Second Operation							
August 22	8.4	3.8	4.6	238		65	16.3	11.5
August 30	8.0				10.4	12	12.0	14.4
September 7	7.3	3.6	3.7		8.4	38	9.0	11.2
September 16	7.2	4.0	3.2		7.3	18	6.3	11.3
October 11	8.0			307	17	11	11.2	12.2
November 2	8.4	4.1	4.3	315	19.5	6	13.2	10.1
November 21	Third Operation							
November 21	7.8	3.7	4.1	261			14.2	10.2
November 28	7.9	3.9	4.0	186	11.1	8	8.4	8.9

The cephalin flocculation reaction was negative in all specimens.

laboratory studies were done on August 7 (see table). The following day an exploratory laparotomy was performed, revealing a nonfunctioning cholecystogastrostomy, chronic cholecystitis, cholelithiasis and choledocholithiasis. The cholecystogastrostomy was taken down and the stomach closed. Choledochostomy revealed 20 to 25 small pigmented stones. After careful probing and scooping of the common and hepatic ducts, a T-tube was placed into the common duct. A cholecystectomy was performed and Morrison's pouch drained. The patient was taken to the recovery ward in good condition.

The immediate postoperative course was uneventful. However, a routine cholangiogram on August 18 revealed that the common and main hepatic ducts were somewhat dilated. A large, polyhedral, radiolucent stone was seen in the left main hepatic duct, and there were mutiple smaller radiolucent stones within a branch of the right hepatic duct. The common duct was free of stones, and the dye entered the duodenum in a normal manner (Fig. 1).

It was felt that the large stone within the left main hepatic duct was so located as to make surgical removal very difficult, if not impossible. At the time of operation the hepatic ducts were probed with great care, and this stone was not palpated. As is shown in the cholangiogram (Fig. 1), the stone was located high in the duct and at such an angle that it could not be scooped out; therefore, it was decided to attempt biliary flush with the objective of flushing the smaller stones into the duodenum and the larger stone into the duodenum or at least into the common duct, where surgical removal would be greatly facilitated. Studies of the blood were done on August 22 (see table). Treatment was begun on August 25, and the following routine was used: The patient received 0.5 Gm. of dehydrocholic acid orally three times a day; every morning and evening 10 cc. of 20 per cent sodium dehydrocholate (Decholin sodium) were administered intravenously. Prior to this the drainage from the T-tube had been thick and cloudy, containing a great deal of debris. Institution of this therapy resulted in a great increase in the volume of drainage and in a thin, golden yellow, clear bile.

This routine was continued daily, and on August 29 another cholangiogram was taken. The large stone remained in the left hepatic duct. However, the right hepatic duct and its branches appeared free of stones, and several small radiolucent areas were seen in the common duct. (Fig. 2). These

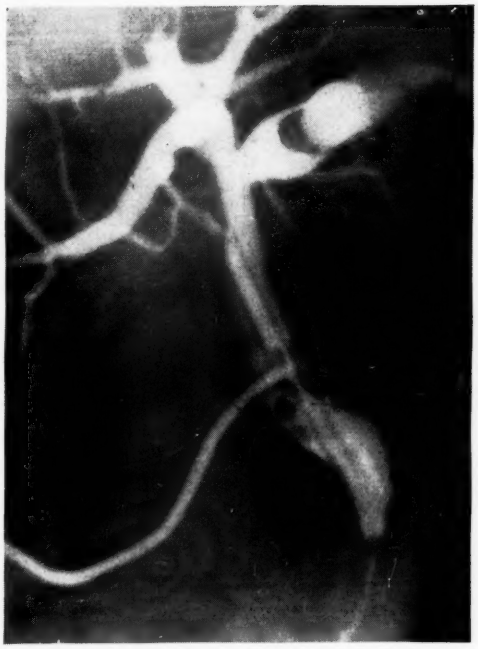

Fig. 2.—Large stone in left hepatic duct; small stones in common duct.

were interpreted as representing several of the small stones which had previously been present in the right hepatic duct.

Intravenous injections of sodium dehydrocholate were continued every other day, and cholangiographic studies on September 17 and October 2 showed the same large radiolucent area in the left main hepatic duct. The right hepatic duct and the common duct were free of stones. It was therefore concluded that the smaller stones had been flushed into the duodenum.

During the aforementioned period, chemical studies of the blood were carried out on three occasions, August 30, September 7 and September 16 (see table). The urine after the seventh postoperative day was free of bile and showed greater than normal amounts of urobilinogen. The stools were brown.

Intermittent intravenous administration of sodium dehydrocholate was continued, and on October 11 a cholangiogram showed the large radiolucency located at the proximal end of the common duct just above the T-tube (Fig. 3). On October 26 a repeat cholangiogram showed that the large calculus had moved 2 cm. distally within the common duct alongside the T-tube (Fig. 4). The same cholangiographic picture was present on November 15.

During this entire period the patient was perfectly comfortable. No adverse affects were noted at any time after the administration of sodium dehydrocholate. However, chemical studies of blood drawn on October 11 and November 2 revealed that the levels of alkaline phosphatase, total cholesterol, and thymol turbidity were slowly rising.

Owing to failure to flush the large stone farther down the common duct, and because of the slowly rising alkaline phosphatase, total cholesterol, and thymol turbidity determinations, it was decided that surgical intervention was indicated for removal of the large stone, which had passed from high in the left hepatic duct to an easily accessible site in the common duct adjacent to the T-tube. The patient was prepared for operation. The results of blood studies recorded on the day of operation are shown in the table. In addition, the laboratory reported a prothrombin activity of 98 per cent; the hemoglobin value was 77 per cent. The red cell count was 4,200,000 per cubic millimiter of blood and the white cell count 7,600. The differential count was normal. During the proceeding ten days urine studies revealed traces of bile, and urobilinogen determinations ranged between a trace and 1 plus.

Fig. 3.—Large stone in common hepatic duct.

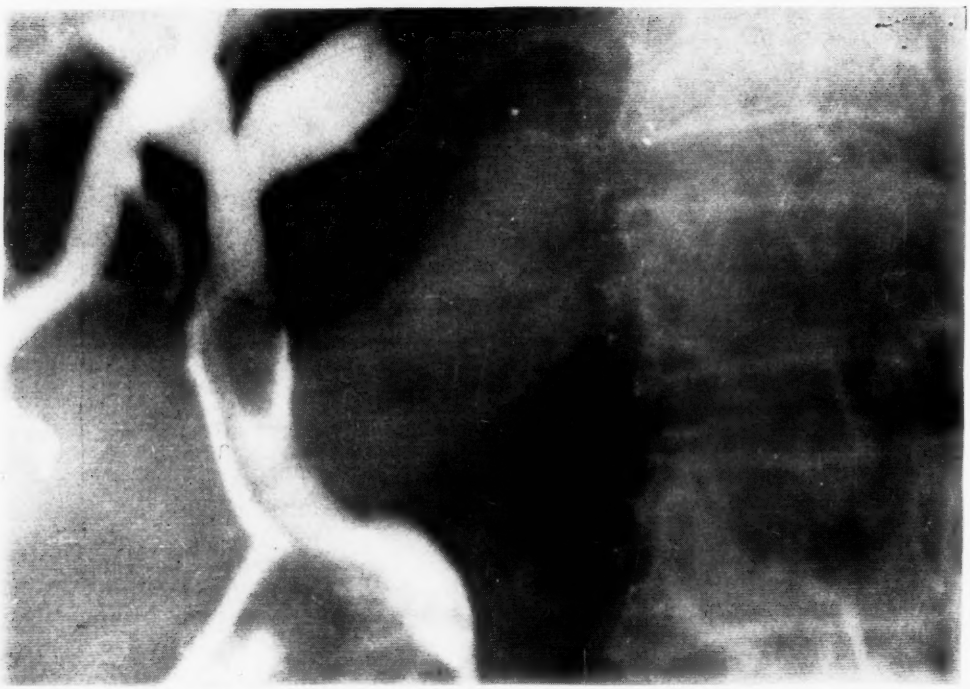

Fig. 4.—Large stone impacted against T-tube in the common duct.

On November 21 a large stone was removed from the common duct with comparative ease, and a T-tube was replaced in the common bile duct. The patient returned to the recovery ward in good condition.

The postoperative course was uncomplicated. The urine gradually lightened in color; after the seventh postoperative day, bile was absent and traces of urobilinogen were present in the urine. The stools were brown at all times. A liver biopsy specimen taken at the time of operation showed chronic perilymphangitis. On November 28 further blood chemistry studies were performed (see table).

Cholangiographic films taken on December 6 and repeated on December 13 revealed the hepatic ducts, their branches, and the common duct to be free of stones. The dye entered the duodenum in a normal manner (Fig. 5). The patient was discharged on December 15 with the T-tube in place, but clamped. She had no complaints.

COMMENT

The erroneous diagnosis made at the time of the laparotomy in 1941 might have been avoided by careful examination of the ampullary area; the diagnosis should not have been made merely by exclusion. In view of subsequent observations, the original disturbance was probably due to impacted calculi.

Calculi high in the hepatic ducts are a serious problem because of their inaccessibility. Reports by Best[5] of the presence of hepatolithiasis in 7 per cent of a series of cases of cholelithiasis and by Weiss[6] of an incidence of hepatic stones in 8.3 per cent of autopsy performed in cases of gallbladder disease emphasize the relative frequency of this condition. In the case here reported, multiple small hepatic duct stones were completely flushed out of the biliary duct system. The larger stone in the left hepatic duct was flushed into the common duct, where it was easily accessible for surgical removal. Further damage to the liver by biliary blockage or cholangitis was thereby prevented.

As Best has emphasized, the stimulation of thin bile, with the resulting accelerated flow and increased intraductal pressure, is needed

to bring about a flushing effect on the biliary duct system. The remarkable hydrocholeretic properties of sodium dehydrocholate make this the desired agent.*

Sodium dehydrocholate is a hydrocholeretic, as opposed to whole ox bile, which is a choleretic. The latter produces an increase in the flow of bile, but the resulting bile is of high viscosity. A hydrocholeretic produces an increase of thin bile. Sodium dehydrocholate produces a marked increase in the output of bile with an increased water content and a decreased amount of total solids per cubic centimeter of bile. This bile is 20 to 25 per cent less viscous than the bile of untreated patients.[2c]

Studies on animals with oral sodium dehydrocholate conducted by Ivy,[7] Berman and his associates[8] and other workers,[9] show that dehydrocholic acid produces a greater increase in the volume output of bile than does any other agent tested. Clinically, these results have been confirmed in studies involving T-tube patients.[10]

Even more striking are the results obtained when sodium dehydrocholate is used intravenously. Grodins, Berman and Ivy[4] noted an increase in bile volume output of 365 per cent over a one-hour period when 20 mg. per kilogram of body weight was given intravenously to dogs. Our clinical studies[3] with duodenal intubation show that patients with stones of the common duct have an increased volume output of at least 100 per cent over a one-hour period in response to 10 cc. of 20 per cent sodium dehydrocholate (Decholin Sodium) intravenously. The peak of this response occurs, on the average, fifteen minutes after injection, and an increased flow of bile is noted at least fifty minutes after injection.

An increased pressure behind a ductal obstruction is important in biliary flushes. Studies[11] with T-tube patients have shown an increased pressure when dehydrocholic acid is administered. An increase in intraductal pressure was obtained, which was 25 to 50 mm. of water greater when the drug was given intravenously than when it was given orally.[12f]

The patient in the case under discussion received sodium dehydrocholate intravenously over a long period without any perceptible toxic effects. Decholin Sodium is a chemically pure bile acid which is the least toxic of all bile acids and bile salts. This fact has been confirmed by the studies of numerous workers.[12]

The long-continued use of intravenous sodium dehydrocholate has been studied by Berman and his co-workers,[8] who found that no change in body weight or alteration of hepatic or renal function resulted in dogs receiving 10 to 20 times the human therapeutic dose daily for three to seven months.

Ivy[7] has prepared a series of dogs with ligation of the common bile duct. One-half of the group were given daily intravenous injections of dehydrocholic acid and the other half used as controls. No significant difference was noted in the survival time of the two groups.

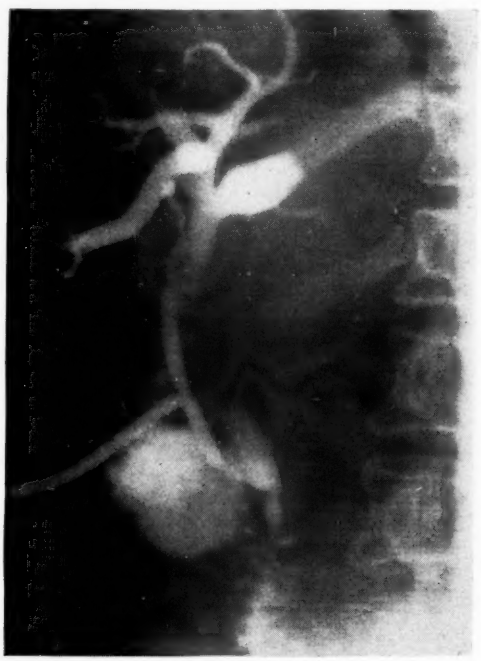

Fig. 5.—Bile ducts free of stones after the third operation.

*Dehydrocholic acid, oxidized unconjugated cholic acid is a crystalline material and is an oxidation product of cholic acid. Cholic acid is the most important of the bile acids and has hydroxyl groups on the 3, 7, 12 positions and is thus named 3, 7, 12 trioxycholanic acid. Oxidation of cholic acid changes the hydroxyl groups to keto groups with the formation of 3, 7, 12 triketocholanic acid or dehydrocholic acid. Sodium dehydrocholate is the salt of this acid and is supplied in a 20 per cent aqueous solution as Decholin Sodium by the Ames Company who generously provided the material used in this study.

SUMMARY

A case is presented which demonstrates that intravenous administration of sodium dehydrocholate is an effective means of irrigating and washing out the biliary duct system. Small intrahepatic duct stones were completely flushed out of the hepatic and common bile ducts, and a larger intrahepatic duct stone was flushed into the common bile duct, where surgical removal was greatly facilitated.

RÉSUMÉ

Présentation d'un cas démontrant que l'administration intraveineuse de sodium dehydrocholate est un moyen effectif pour l'irrigation et le lavage du système de canaux biliaires. De petits calculs du canal intrahépatique furent ainsi chassés des canaux hépatiques et cholédoques et un calcul plus important du canal intrahépatique fut poussé dans le canal cholédoque commun d'où son prélèvement fut par là grandement facilité.

RESUMEN

Se presenta un caso que demuestra que la administración intravenosa de dehidrocolato sódico es un medio eficaz de irrigar y lavar los conductos biliares. Pudieron asi eliminarse totalmente de los conductos hepático y colédoco pequeños cálculos intrahepáticos proyectándose por irrigación un cálculo intrahepático en el conducto biliar, lo que facilitó notablemente su extirpación quirúrgica.

RIASSUNTO

Presenta un caso che dimostra la possibilita' di eliminare mediante iniezioni endovenose di deidrocolato di sodio piccoli calcoli intraepatici. In questo caso piccoli calcoli situati nei dotti intraepatici sono stati spazzati fuori dei dotti epatici e del dotto comune: un calcolo piu' voluminoso e' stato eliminato dai dotti intraepatici nel dotto comune, da cui e' stato facilmente asportato mediante l'operazione.

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Safe Surgery of Gallbladder and Bile Ducts

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ON THE subject of surgical treatment of the bile ducts much has been written and said. No operation taxes the surgeon's ability more. The vitallium tube has been heralded and discarded, as have many other expedients. Today one school brings the jejunum to the bile duct, another with amazing skill dissects the stump of the bile duct from the pancreas and, by mobilizing the duodenum, approximates it to the upper ductal vestige literally wheedled from the liver; and, to crown all, portions of the liver are resected to obtain enough of a duct to implant into the jejunum.

These operations are a remarkable tribute to surgical dexterity, but they are all immensely difficult. As was aptly remarked at a recent symposium on the subject, patients requiring bile duct repair should be directed to a hospital where the necessary skill has been developed; but this too is difficult and sometimes impossible. To watch Arthur Allen, Cattel, Lahey or Waltman Walters solve the apparently insoluble problem of the damaged bile duct reveals the essence of fine surgery; but to achieve this superlative skill requires continuous practice. In the smaller countries of the world such practice is not available, and some other solution must be sought. At the Johannesburg General Hospital we strive to attain this end not by instructing our surgical trainees in the performance of these heroic procedures, but by impressing on them the wisdom of doing only what they can do with safety to the patient, and not being afraid to do rather less than they have set out to do if this is in the patient's best interest.

BASIS OF THIS STUDY

The material used in this study is taken from two sources. It includes data on the gallbladder from the Johannesburg General Hospital from 1945 to 1949 and from one surgeon's records in private practice from 1940 to 1949. The accompanying table is a summary of these data.

Operations on the Gallbladder

	No. of cases	Common duct explored	Deaths	Returned for bile duct repair
Johannesburg General Hospital	369	77(20.9%)	15(4%)	4(1.1%)
Private patients	259	56(21.6%)	6(2.3%)	0

It is noticeable that in the hospital figures the operative mortality was 4 per cent. Among private patients it was about half that. In the hospital series the common bile duct was injured in at least 4 cases—about once in each 100 cholecystectomies. In the private series there was no case of injury to bile ducts. It is in the hospital that the surgeon gets his training. Does this mean that the trainee must gain his experience by causing unnecessary deaths and injuring the common bile duct? The answer should assuredly be "no." During the period in review I saw 4 private patients with injured ducts, none of whom had been operated on in the Johannesburg General Hospital. The impression is gained that the vast majority of injuries to the common duct are not treated in the great hospitals but in the smaller towns, where surgeons have not the advantage of precept and example. It has been truly said that surgery of the bile passages is the most difficult type of surgery, and for the inadequately trained doctor to undertake it is a crime against the individual and the State. A "surgical conscience" is an essential part of the surgeon's armamentarium. Without it the surgeon is poorly equipped indeed.

There is unfortunately no way of supplying the deficit. It is regrettable that in most countries the doctor, on obtaining his qualifying degree, is legally entitled to practice the whole

Grateful acknowledgment is made to my registrar, Mr. Joseph Lannon, F.R.C.S. (Eng.), and to Drs. Brukin and Katz, my house surgeons, for assembling the data from the hospital records.

range of medicine and surgery. In the Union of South Africa it has recently become law that no doctor may go into private practice until he has completed one year of internship. This safeguard at least prevents the tyro from putting up his plate before he has obtained a modicum of experience. It has been urged in responsible quarters that the practice of surgery be permitted only to those who satisfy certain stringent criteria, but hitherto the step has been found impracticable. There is little doubt that such restrictive measures will ultimately be introduced. The training given in certain of the United States to enable candidates in surgery to pass the State Board examinations is the ideal to be aimed at.

GENERAL CONSIDERATIONS

Before operating on the bile passages the trainee surgeon should know certain fundamentals:

1. *Adequate Exposure.*—(*a*) In the hyposthenic type of patient with a long, narrow chest the incision should be paramedian, displacing the rectus laterally. *It must reach the costal margin.* (*b*) In the sthenic type, with a wide upper abdomen, a transverse incision presents the advantage that one or both recti may be divided without damaging the nerve supply. The subcostal incision of Kocher is excellent. It presents the disadvantages that, if any pathologic change other than the expected one is found, it cannot be enlarged without serious injury to the abdominal wall. Neither the transverse nor the subcostal incison should be extended beyond the lateral border of the rectus muscle. The level of the incision is determined by the position of the liver. If this organ is enlarged or low, an incision placed too high will make the operation needlessly difficult.

2. *Knowledge of Anatomy.*—This area is notorious for variability. It is for this reason that a law governing operation on the bile passages has been evolved: No structure may be divided until the anatomic character and environment of the part has been adequately displayed.

3. *Diagnosis.*—This requires meticulous palpation of the gallbladder, bile ducts and pancreas. Nothing is more disturbing than to feel a stone in the bile duct and subsequently fail to find it. Palpation should therefore be gentle, and stones should be "milked" distally. Palpation of the head of the pancreas should be deliberate and thorough. Twice I have seen a yellow, diseased gallbladder removed after cursory examination of the pancreas, only to reveal in 1 case that a carcinoma of the pancreas was present after that valuable ally, the gallbladder, had been removed. This is poor surgery. The bile duct should be dealt with first, and the gallbladder removed only when its uselessness has been established. In the second case, continuing jaundice led to reexploration four months after the first operation, and this disclosed a well advanced pancreatic carcinoma which had been missed at the first operation.

Maingot[1] puts the incidence of stones of the common duct in calculous cholecystitis at 25 per cent. Ninety per cent of stones of the common duct originate in the gallbladder.

When should the bile duct be explored? 1. When it is dilated. 2. When it contains stones. 3. When there has definitely been jaundice. 4. When the gallbladder contains stones. 5. When in doubt.

The decision is an important one. Allen[2] has estimated the mortality rate of simple cholecystectomy at 1.6 per cent. When cholecystectomy is combined with exploration of the bile duct, it is 4.25 per cent. When the duct does not contain stones, exploration does not increase the risk.

Palpation alone is not sufficient to exclude stone in the duct. Lahey stated that at his clinic the duct is being explored more and more often, with negative results in a third of the cases. In the personal series of cases here reported the duct was explored in 21.6 per cent, with negative results in 14 per cent.

In opening the bile duct, two stay sutures of fine catgut are passed through the duct wall and the tube opened between them in its long axis for as short a distance as is compatible with the intraductal manipulations; in any case, for a distance not greater than the diameter of the duct.

TECHNIC IN GENERAL

If the duct is dilated or contains stones or biliary mud it is drained with a T tube. This tube must be draining bile before the abdomen

is closed. If the duct is not pathologic it is closed as advised by Reinhoff.[3]

The patency of the sphincter of Oddi is determined by the use of a flexible lead probe and de Baikie's graduated dilators. The normal orifice admits a 3 mm. probe. If the orifice is constricted it is dilated to 7 mm. Arthur Allen moves to the patient's left when dealing with the sphincter. This suits a right-handed surgeon, who can manipulate the dilators with his right hand while holding the second part of the duodenum to control the end of the dilator with his left hand.

The two main reasons why the common duct is injured are:

1. Pulling on the gallbladder, tenting the common duct, and clamping the common duct instead of the cystic duct. This is most likely to happen in the "easy" case. It arises from failure to display the anatomic structures and should not occur.
2. The haphazard application of artery forceps when sudden severe hemorrhage obscures the field. Many years ago, while acting as house surgeon to Sir David Wilke, I saw him in just such a case control bleeding with his left forefinger in the foramen of Winslow (epiploicum) and his thumb on the front of the structures in the right free border of the gastrohepatic omentum. The bleeder was easily picked up and tied in the resulting dry field. This is now standard practice.

Thus, further rules emerge:

1. Deal with the pathologic condition in the bile duct before attacking the gallbladder.
2. Remember that the existence of a pathologic gallbladder does not exclude cancer of the head of the pancreas.

Should the procedure begin medially or laterally? Arthur Allen of Boston has advised that it should begin laterally, i.e., from the fundus. This is a more tedious procedure than the other, as the blood supply is secured only at the end of the mobilization. There can be no question about the soundness of this advice:

(*a*) There is no cystic vein and venous blood enters the liver through short veins that can be exposed and ligated in the fundus first type removal.

(*b*) The anatomic operative field can be more deliberately and readily exposed. If one uses the mobilized gallbladder as a handle, the duct system can be visualized, particularly above the entry of the cystic duct, where the hepatic arteries also lie.

(*c*) Should a reason be disclosed for not removing the bladder, its duct and artery are intact at the end of the mobilization procedure, and the viscous can be reattached without injury. This is a theoretical rather than a practical point.

DETAILS OF TECHNIC

There are two assistants, one opposite the surgeon and one on his left.

The swabs are placed and retracted—one below, which holds down the colon and duodenum; one in a medial position, which holds the falciform ligament and the stomach medially, and one above, which retracts the liver.

The injection of physiologic solution of sodium chloride beneath the peritoneal coat of the gallbladder is useful, as a generous plane of cleavage is formed.

The serosa over the gallbladder is cut with a knife ¼ inch (0.6 cm.) from the liver and the viscus separated from its bed, the vessels being deliberately secured as they are exposed.

The liver, when adherent, is separated by blunt dissection from the gallbladder and not vice versa. The gloved finger is frequently used to advantage in mobilizing the deeper part of the organ. There is often a fair amount of oozing, which stops when the cystic artery is secured.

In difficult operations the main trouble arises between the common hepatic duct and the proximal part of the gallbladder and cystic duct. In this area there normally exist strong fibrous attachments. These are much more dense after repeated attacks of inflammation. Here lie hepatic ducts, the common and the right hepatic, and cystic arteries. The surgeon may expose the common bile duct readily enough, but there may be inextricable adhesions above the region where the cystic duct or the infundibulum of the gallbladder approximates the main ducts. It is apparent, therefore, that the most vulnerable structure is not the common bile duct but the common hepatic or the right hepatic duct.

When this state of affairs obtains, the stage is set for injuring important structures. Division of the serosa transverse to the gallbladder axis approximately 1 inch (2.5 cm.) lateral to the line of the main ducts will sometimes allow the dissection to proceed medially beneath the resulting serosal flap. Sometimes, however, there is no plane of cleavage. It is then often advisable to cut away the distal part of the gallbladder and grasp the cut edge of the remaining portion in forceps at several

places along the circumference. This enables the surgeon to see the amount of gallbladder that remains, and it may then be possible to dissect this from its surroundings.

The situation and direction of the cystic duct may now be determined with a probe. If there are stones in the cystic duct, they can be extracted or removed after one has cut down carefully on a probe in the duct. Should it still be considered unsafe to divide the gallbladder from the duct system, one proceeds as follows: destroy the remaining mucous membrane of the gallbladder by diathermy and tie a transfixion ligature across the stump. Should diathermy not be available, just transfix and tie.

It is far better to leave the cystic duct and even a small part of the gallbladder than to be heroic when the anatomic picture is unknown. The patient with a divided common hepatic artery will die. The patient who sustains damage to one of the great bile ducts may survive, but he is doomed to a very few years of misery and suffering despite all the surgeon can do. The gallbladder may reform from a stump, but this event is a surgical curiosity and in any event a subsequent removal, if necessary, will be attended with less hazard. The bile does not clot; therefore the divided cystic duct heals by approximation to contiguous structures. It is then necessary to reconstitute the right border of the gastrohepatic omentum, thus burying the stump. The suture is continued and the gallbladder bed closed by suturing the peritoneal edges prepared for this purpose.

The hepatorenal pouch (Morrison's pouch) should be drained—an absolute rule. A ligature may slip or be pushed off by straining. Accessory bile ducts may have been divided and escaped recognition. Bile peritonitis is always fatal. A drain deals with all these contigencies. Here, as elsewhere in surgery, never drain through the main wound but through a stab. Even though a T tube has been inserted, it will not drain the hepatorenal pouch. A Penrose drain should be placed in the pouch.

COMMENT

The most important aspect of surgery of the biliary passages is the need of constant vigilance. Canny Ryall once said that advances in surgery lie not in the development of more aggressive procedures but in the replacement of major by minor ones. For many years cholecystectomy was the procedure of choice for the gallbladder cases, and a very successful one it was. The surgeon should never hesitate to use it if the well-being of the patient so demands. If he doubts his ability to remove the gallbladder safely, he should drain it. Our young doctors are rightly taught never to be ashamed to say "I don't know." Our young surgeons should similarly be taught that they must not hesitate to do rather less than was intended if the patient's life and well-being are thus assured. Perhaps this is the hardest lesson of all to learn, but if it were learned the damaged duct would be a curiosity rather than a common observation.

The ten commandments for the young surgeon operating on the gallbladder are:

1. Obtain adequate exposure.
2. Know the anatomic picture.
3. Employ retrograde removal.
4. Divide no structure until the anatomic structure of the part is adequately displayed.
5. Deal with the bile duct before attacking the gallbladder.
6. Remember that a pathologic gallbladder does not exclude cancer of the pancreas.
7. If removal of the entire gallbladder is unsafe, drain it.
8. If removal of a part of the gallbladder is unsafe, leave it behind.
9. Drain in every case.
10. An unfinished operation "re infecta" is better than a dead patient.

I can do no better than quote verbatim a message from that Colossus of surgery, Frank Lahey,[4] to the Southern Surgical Association of America:

"This is so trite that I blush every time I say it, but we ought to concentrate on giving more attention to publicizing how dangerous cholecystectomy is. We realize that cholecystostomy has been almost abolished, but thousands of cholecystectomies are being done every day and each one is a possible stricture. If the patient died instead of recovering after injury to his ducts, in many cases he would be better off than to live with what he has to go through in the way of expense and suffering. We should publicize the fact that cholecystectomy is a dangerous operation. It is dangerous unless one realizes how important it is to control the blood supply, to demonstrate definite-

ly the anatomic relationship, and to realize that anomalous anatomy is very common. I believe we could do nothing better than to write more and more on the need for accuracy in cholecystectomy."

SUMMARY

The author outlines certain basic principles of surgery, with special reference to operations on the gallbladder and bile ducts. This is a "teaching article," designed to help orient the younger surgeon in his work.

RÉSUMÉ

L'auteur esquisse certains principes fondamentaux de chirurgie, s'intéressant particulièrement aux opérations sur la vésicule biliaire et sur les canaux cholédoques. Voici un article d'intérêt éducatif s'adressant au jeune chirurgien au début de sa carrière.

RESUMEN

El autor expone ciertos principios básicos de cirugía con especial referencia a la intervención sobre la vesícula biliar y conductos biliares. Este artículo ha sido escrito con un propósito didáctico para orientar al joven cirujano en su trabajo.

RIASSUNTO

L'articolo ha un carattere didattico, designato ad orientare meglio il giovane chirurgo nel suo iniziato. Comprende alcuni principi chirurgici fondamentali, specialmente per quanto riguarda le operazioni sopra la cistifellia e di dotti biliari.

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Every step of progress the world has made has been from scaffold to scaffold and from stake to stake.—*Phillips*

The law of life: Man is not man as yet.—*Browning*

Progress is the stride of God.—*Hugo*

Many persons might have attained to wisdom had they not assumed that they already possessed it.—*Seneca*

Aqueous Solution of Phenol as a Substitute for Alcohol in Sympathetic Block

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IT WOULD be worth while to study the further possibilities of therapeutic block of the sympathetic nerves, which has such a wide field of application in modern medicine. Trends toward future development of the method in general are moving in two directions:

1. *To secure the proper site for injection.*—This is hazardous in the presence of the many anatomic anomalies, and because of the smallness of the structures concerned in a deep body region. To meet these difficulties the following methods have been tried:

(*a*) Roentgen control (White and Gentry): These authors believe that this simple method of checking the position of the needles roentgenoscopically is a distinct aid toward accuracy of paravertebral injection for chemical destruction of the cardiac sensory pathways in cases of angina pectoris. I tried the method described and found it annoying for patients with advanced stenocardiac conditions.

(*b*) The use, in sympathetic block, of an apparatus devised by Philippides, following the idea of Kirschner, which described such an apparatus for the injection in the gasserian ganglion. This apparatus seems to me of no help in the case of irregularities of the sympathetic ganglions.

(*c*) "Endothoracic sympathectomy," which, after establishing a pneumothorax, permits destruction of the sympathetic structures under vision of a thoracoscope. The method was first used by Hughes and Goetz and further developed by Kux. For "poor risks" with angina pectoris this is a major operation, while easy cases in general, judging by my experience, do not reach the surgeon's office.

2. *To modify the drug injected into the sympathetic nerves for securing a lasting effect of block without dangers and complications.*—This is an especially urgent requirement for patients with angina pectoris. Even if treatment by sympathetic block with novocain, introduced by myself in 1925, gives satisfactory results in more than 50 per cent of the cases regardless of different etiologic factors, I feel that the shortcoming of the method consists in the more or less transitory action of novocain or procaine.

The first step to improve the result was taken in 1926 by Swetlow and later by I. C. White, by introducing alcohol instead of novocain for chemical interruption. The results of White with alcohol sympathetic block have been much more satisfactory than with novocain; he achieved 80 per cent good results. But another complication and unpleasantness appeared: alcohol neuritis of the intercostal nerves, which White explained as follows: "The sympathetic ganglia lie so close to the intercostal nerves that alcohol infiltration around the chain cannot help bathing their trunks. They are paralyzed at first, but anesthesia begins to disappear in their anterior divisions within a fortnight.

"Within a month the intercostal nerves are recovering along their entire length, and with this, there is a greater or lesser degree of hyperesthesia of the chest wall which commonly persists for a number of months. . . . In most cases the discomfort is quite bearable and clears up in a month or two. In others, about 10 per cent, it is more troublesome."

There is no question that alcohol neuritis constitutes a serious objection to treatment by alcohol block. In my own experience this complication occurred in about 10 per cent of cases. A large number of patients suffering from alcohol neuritis after block was reported by Levy and Moore. Of their 45 patients, neuritis occurred in 38, and in 3 instances it was described as severe. Perlow reported a mild degree of alcohol neuritis in approximately 20 per cent of his cases.

Flothow observed neuritis frequently, and Patterson and Stainski rejected the method altogether for that reason. The same stand was

taken by de Takats. Cases of neuritis lasting "until death" were reported by Ransohoff and Grant, Saland and Klein and many others who dislike alcohol block for this reason.

It is to be understood that some surgeons abandoned chemical interruption of the sympathetic fibers altogether and looked for other operative methods, old or new, which result undoubtedly in a higher mortality than does sympathetic block. To this group belong, among others, Lindgren and Olivecrona: "The most important objection, however, is the alcohol neuritis which follows and which is apparently a very disturbing feature in many cases."

The prophylaxis of alcohol neuritis, used for years in my own cases and in most of them successful, could not change the aforementioned objections for a method which is satisfactory *per se*.

Quite naturally, therefore, an agent has been eagerly sought which would have greater efficacy than has novocain, without the side effects of alcohol.

After studying the effect of novocain and the sympathetic ganglions, Mandl and Rabinovici for various reasons made similar experiments with aqueous phenol solution. Phenol has long been used in physiologic experiments to destroy the sympathetic nerves (Asher and Pearce). It was introduced into clinical practice by Doppler, who used it in 5 to 7 per cent solution for chemical destruction of vascular sympathetic elements. After painting the spermatic or ovarian artery he noted increased blood flow to the genital organs and increased hormone production.

I performed the following experiments: In cats under general anesthesia the cervical ganglion was exposed and 0.2 cc. of a 6 per cent phenol solution was injected into the ganglion (see Mandl). The Horner syndrome appeared much earlier than after novocain injection (after fifteen minutes, on an average). It was intense, and enophthalmus was particularly distinct. It persisted for fourteen days on average (with novocain it had been five days!). Macroscopic and microscopic results were recorded after twenty-four hours, three, seven, thirty, forty-five and seventy-five days respectively. Complete necrosis of the nervous elements appeared with greater intensity than after injection of novocain. Only the connective tissue remained. The blood vessels of the perineurium were engorged. Staining with toluidin blue produced only a pale blue area. The pink color was almost entirely absent. Only in the peripheral zones were a few remnants of nervous elements still visible. After forty-five days destruction was still complete, with no sign of regeneration. After seventy-five days regeneration took place.

In comparison with the pathologic picture after the same experiment performed with novocain, it can be said that the effect of phenol is more powerful than that of novocain, as is evidenced by the earlier appearance and longer persistence of the Horner sign and also by the greater intensity of the destructive process from the start.

Further experimental studies were performed, and injections of the phenol solution in skin, muscles, fascia and pleura microscopically studied. They revealed that the injection of 6 per cent aqueous solution of phenol involves no danger of necrosis in these tissues.

These experiments were performed in 1945 and at that time had not been applied in practice.

In spite of the aversion to identify morphologic changes in sympathetic structures and interruption of their function, it seems that in that case exists a kind of parallel between the grade of destruction of sympathetic fibers on the one hand, and lasting clinical effect on the other.

The most effective drug for chemical sympathectomy is alcohol, which destruction in the sympathetic ganglions and the rami communicantes was shown in microscopic pictures by Merrick. The least effective drug is novocain or procain, either of which produces relatively short degeneration of the sympathetic ganglion (Mandl and Rabinovici, 1947). The drug most similar to alcohol seems to be aqueous solution of phenol after our experience with the microscopic pictures and after observation of the clinical results (to be mentioned later).

The first clinical application of aqueous solution of phenol for chemical sympathectomy was published by Haxton in 1949. He used the method in 220 cases of vascular disorders of the extremities. In his opinion, interruption of sympathetic activity can persist for at least

two years The procedure may be repeated if necessary. The complications encountered after the paravertebral injection of alcohol have not occurred with phenol. Of course, Haxton emphasizes, the method should be employed only by those who have large experience with the blocking of the sympathetic chain.

After Haxton, the Neurovascular Unit of the Manchester Royal Infirmary employed the new treatment. Boyd, Ratcliff, Jepson and James used injections of 10 per cent aqueous solution of phenol. After novocain is injected in the sympathetic chain as a test measure (with the usual consequences), 10 to 15 cc. of 10 per cent phenol solution is injected into the right place. Vascular diseases of the peripheral vessels has been treated and the authors conclude: "Chemical sympathectomy with 10 per cent phenol has a definite though limited place. The method has been used in patients over the age of 60 years and in those in whom lumbar ganglionectomy was contraindicated by reason of their general condition."

I tried sympathetic chemical interruption with aqueous solution of phenol (6 per cent) after the technic described by the Manchester group. I have been eager to block the thoracic ganglions, in order to compare the results with those of alcohol interruption. I have treated in a tentative way only 15 cases. In 3 cases of angina pectoris the ganglion stellatum has been injected and the first four to five thoracic ganglions too. In 5 cases of thromboembolic conditions of the brain, the ganglia stellata have been infiltrated with the phenol solution. In 6 cases of "intermittent claudication" the lumbar sympathetic chain has been injected. In 1 case of arterial embolism of the femoral artery the phenol block improved the condition immediately and did not require to be repeated.

No complication, no postoperative pain, no swelling and no signs of neuritis appeared. In the first group of cases the Horner sign appeared suddenly after the interruption and lasted always more than three days, which does not happen after interruption with novocain.

The immediate results have been satisfactory, and I hope in the course of time to obtain proof that chemical sympathectomy with phenol solution has a more lasting effect than has blocking with novocain, but without the complications of blocking with alcohol.

SUMMARY

Further development of chemical sympathectomy is suggested. Interruption of the sympathetic structures with aqueous solution of phenol (6 to 10 per cent) is recommended on the basis of experimental studies and clinical experiences. The indication of surgical sympathectomy is not discussed.

RÉSUMÉ

L'auteur demande que l'on approfondisse l'étude de la sympathectomie chimique. L'interruption de l'action de l'appareil sympathique au moyen de la solution aqueuse de phénol (de 6 a 10 pour cent) est recommandée en se basant sur les recherches expérimentales et sur l'expérience clinique. Les indications relatives au choix des cas ne sont pas présentées.

RESUMEN

Se recomienda como un nuevo adelanto en la práctica de la simpatectomía clínica la interrupción de las vías nerviosas simpáticas mediante una solución acuosa de fenol (6 a 10 por ciento), basándose en estudios experimentales y experiencias clínicas.

RIASSUNTO

Raccomanda ulteriodi indagini sopra la simpatectomia chimica. Consiglia—in base a ricerche sperimentali ed osservazioni cliniche —l'interuzione del simpatico con soluzioni acquose di fenolo (6-10%). Le indicazioni della simpatectomia chirurgica non vengono invece discusse.

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Intramedullary Nailing of Intertrochanteric and Subtrochanteric Fractures with Curved Nail

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OPERATIVE treatment of intertrochanteric and subtrochanteric fractures of the femur is justified only if the final results of an open procedure are clearly superior to those of conservative treatment. To be sure, there would be little reason to replace the effective treatment of extension and immobilization by open reduction if it were not for early weight bearing and activity. However, the accepted methods of open reduction can do no more than shorten the period of immobilization if massive nails, screws or steel plates are applied and involve operative risks and possible infection. These risks can be avoided by using less extensive procedures, but this usually involved the sacrifice of early stability for the sake of surgically achieved good position. Therefore, like most compromise solutions, the less extensive procedures are unsatisfactory.

Open reduction can be considered superior if the procedure (1) allows early weight bearing (eight to ten days after the operation); (2) is so simple that it entails no greater risk to the patient than does conservative treatment, and (3) is applicable in all cases of trochanteric fracture, including compound fracture.

In my opinion all these requirements are fulfilled by the use of a curved intramedullary nail of the Kuentscher type, driven from the medial cortex of the femur through the upper third, then through the fractured trochanter into the femoral neck and head.

The nail has about the form of a quarter circle, according to a description by my assistant, Dr. Herzer. Stability of the fragments depends largely upon the points of support to which the nail is anchored in the marrow cavity (Fig. 1). These are:

1. The medial cortex, directly above the nail's entrance into the shaft;
2. The lateral cortex, 5 to 7 cm. above the nail's entrance;
3. The upper and lower cortex of the neck.

All these places of support are, in my opinion, located in healthy and weight-resistant bone.

By applying Kuentscher's principle of intramedullary nailing I have been able to transmit the body weight from the femoral head via the nail to healthy femur. Since the thigh bone is more or less straight, the curved nail is securely supported by the corticalis and does not slide out.

The shape of the nail serves a twofold purpose: (1) it maintains the angle of the femoral neck, and (2) it securely wedges the lower end of the nail into the femur.

The anatomical characteristics of the femoral medullar cavity facilitate the introduction of this nail. A slightly protruding ledge on the inside of the mesial cortex is formed by the architecture of the femoral neck. The nail, inserted into the bone at the lower margin of this ledge (10 to 12 cm. below the lesser trochanter), uses it, so to speak, as a rail along which it slides upward, through the previously reduced fracture into the neck and head.

The shape of the nail need not vary, because the medullar cavity allows sufficient shape for adjustment and the angle between the femoral neck and the shaft lies between 120 and 130 degrees; therefore, a nail curved to an angle of 125 degrees can be used in all instances. But the size of the nail differs with the individual case, depending upon the width of the medullary cavity. Too thick a nail may be wedged into the cortex. Roentgenograms help to determine the size suited to a medullary cavity of a given width. Commonly the nails have a diameter of 9 to 10 mm. (Fig. 2). The length of the nail depends upon the measurements of the upper part of the femur to the planned entrance of the nail, which should be chosen as far downward from the fracture as possible,

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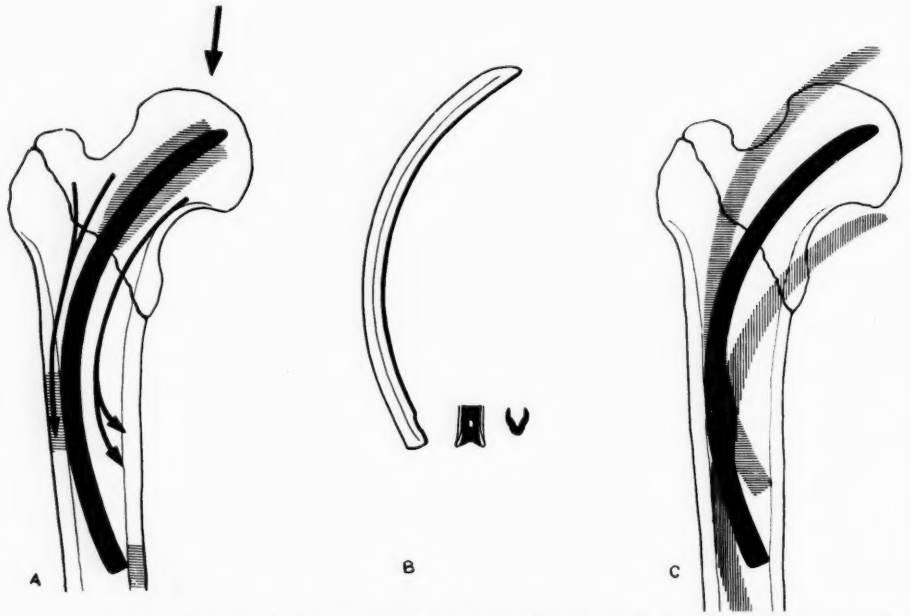

Fig. 1.—*A*, points of support to which nail is anchored into cavity (see text). *B*, sketch showing curve of nail and simplicity of construction. *C*, nail *in situ*. Shaded areas represent danger of perforation of cortex if nail is improperly introduced (see text).

on the medial aspect of the femur. The length of the nail varies between 15 and 17 cm.

The nailing itself is technically simple and is done without special instruments.

TECHNIC

For the first five to eight days the patient is treated conservatively to overcome shock and to stabilize the circulatory system. Skeletal traction is applied to either the upper part of the tibia, or the lower part of the thigh bone. Under traction of 3 to 5 Kg., with the extremity internally rotated, the fracture usually sets itself within a week.

For the operation the patient is placed on an extension table, the following preparations having been made:

1. The roentgen control pictures in two planes must show the fracture well set. (Only pictures on which the femoral head, neck, trochanter and upper third of the femur are visible provide sufficient proof.) Perfect reduction is a prerequisite to a successful procedure.

2. The curve, length and width of the nail are determined with the help of roentgenograms taken after reduction.

3. The point of nailing is marked at the medial edge of the femur. This is most important, because any change upward or downward changes the course of the nail, which then might perforate the cortex of the neck and come out either above or below the femoral head (Fig. 3).

For exact placing of the trepan hole through which the nail is driven, compasses are used, of a radius that corresponds with the length of the nail's secant. After one leg of the compass has been placed on the femoral head, the other then projects the length of the nail's secant on the thigh bone. By this procedure the line of incision, as well as the point of entry of the nail, is determined.

The operation is done with either spinal or gas anesthesia. The patient is placed on the table with both legs abducted (distance of heels re.-li. 70 to 80 cm.). The fractured leg is held in maximal internal rotation; the surgeon stands between the legs of the patient.

A cutaneous incision 5 to 8 cm. long is made

over the medial aspect of the thigh at the point previously determined by the compasses, and the femur is exposed for about 5 cm. between the retracted abductors. Before the medullary cavity is opened with the trepan, rechecking of the point for drilling the hole is advisable. The trepan opening should be made large. If the nail does not glide in easily, it becomes wedged into the corticalis and breaks it. Distal to the drill hole the cortex is flattened by a gouge, so that the nail can be started more easily and can be held in the proper direction, which is the horizontal plane. If the nail deviates from the horizontal it is apt to miss the femoral head.

The nail is driven home with strong hammer blows. After its convexity passes the inner surface of the lateral cortex, the nail encounters less bony resistance and glides quickly upward through the fractured parts. When it reaches the neck one can feel renewed bony resistance. At this stage of the operation, the position of the nail is checked by roentgenogram; if it is satisfactory the procedure is terminated by a few more hammer blows.

If the position of the nail is faulty, it is retracted and introduced anew, with the necessary change of direction. The reason for a faulty position of the nail is due mostly to inaccurate measurements or errors in technic.

With the nailing completed, a last roentgen control film is taken before the suturing of muscle and skin terminates the operation. The skeletal extension is removed; the leg is held in slightly abducted position between sandbags. After the wound has healed, active exercise of the leg may begin. The patient may get up and start walking as soon as he is able to lift his leg. It is surprising to observe how secure patients feel when taking their first steps after this procedure.

SUMMARY

The indication for operative treatment of intertrochanteric and subtrochanteric fracture has been, in my opinion, enlarged by a procedure that assures stability of the fractured part and consequently its immediate weight-bearing capacity. Also, this treatment endangers the patient less than does a long rest in bed, which is required for conservative treatment. The application of this technic, there-

Fig. 2.—*A*, fractured femur. *B*, curved correctly applied, permitting immediate weight bearing.

fore, is justified in cases of simple trochanteric fracture of the first and second degrees, as well as in cases of the most severe trochanteric fractures, for which it was originally designed. Since its development, the prognosis for all trochantéric fractures seems greatly improved (Fig. 2, *A* and *B*).

Thus far, 22 patients between the ages of 67 and 86 years with trochanteric fractures (first to fourth degree) have been so treated. All could leave the bed after a healing period of ten days; all could move and bear weight on the leg securely and without pain. The postoperative period was shortened and simplified.

RÉSUMÉ

Les indications pour le traitement chirurgical des fractures intertrochantérienne et sous-trochantériennes ont reçu un champ plus large, je crois, de par un procédé qui assure la stabilité du membre lésé et, par conséquence, sa possibilité de supporter immédiatement le poids du corps.

Ce traitement a aussi l'avantage d'épargner au malade les dangers d'un long séjour au lit, exigé par le traitement conservateur; Cette technique se justifie donc dans les cas de simple fracture trochantérienne du premier ou deuxième degré, pour laquelle il a été conçu. Le pronostic de toutes fractures trochantériennes a été grandement amélioré dès son application. L'expérience démontre que le principe théorique qui nous a conduit à nous servir du clou incurvé était bien fondé (Fig. 4 et 5).

Jusqu'à présent, 22 malades, de 67 à 86 ans, atteints de fractures trochantériennes (du premier au quatrième degré) ont été traités ainsi. Ils ont tous quitté leur lit après une période de cicatrisation de 10 jours, tous pouvaient se mouvoir et s'appuyer sur le membre lésé avec assurance et sans douleur. La période post-opératoire fut écourtée et simplifiée.

RESUMEN

A juicio del autor las indicaciones para el tratamiento operatorio de la fractura intertrocantérica y subtrocantérica han aumentado gracias a un método que asegura la estabilidad de la parte fracturada, y en consecuencia su immediata capacidad para soportar el peso del cuerpo.

Por añadidura, este tratamiento es menos peligroso para el paciente que un reposo prolongado en cama, medida requerida en los tratamientos más conservadores. La aplicación de esta técnica, por lo tanto, está justificada en los casos de fractura simple del trocánter de primero y segundo grado, así como en los casos de fracturas más graves del trocánter, para la que se ideó originalmente. Desde su desarrollo parece haber mejorado notablemente el pronóstico de todas las fracturas del trocánter. La experiencia práctica ha demostrado que el principio teórico en que se basa el autor para emplear un clavo incurvado es técnicamente correcto. (Fig. 4 y 5.)

Hasta la fecha, 22 pacientes de edades comprendidas entre 67 y 86 años con fracturas del trocánter del primero al cuarto grado se han tratado por este método. Todos ellos pudieron levantarse al terminar un período de curación de 10 días. Todos pudieron también moverse y soportar su peso sobre la pierna de un modo seguro y sin dolor. El período postoperatorio se acortó y simplificó.

RIASSUNTO

Le indicazioni per la cura chirurgica delle fratture intertrocanteriche e subtrocanteriche si sono—nell'opinione dell'A.—notevolmente estese in base ad un procedimento che assicura la stabilita' dell'osso fratturato e consente un'immadiata capacita' di sostegno, eliminando i pericoli di una prolungata degenza a letto, richiesta dalla cura conservativa. Il metodo descritto dall 'A. puo' essere applicato tanto alle fratture trocanteriche semplici, di primo e secondo grado, quanto alle fratture trocanteriche piu' gravi, per le quali era stato originalmente ideato. La prognosi per tutte le fratture trocanteriche e' notevolmente migliorata: l'esperienza clinica ha dimostrato che il principio teorico che aveva consigliato l'uso di un chiodo ricurvo (fig. 4-5) era giusto.

L'A. ha operato con questo metodo 22 pazienti, da 67 a 86 anni, colpiti da ogni varieta' di fratture trocanteriche (dal 1°-al 4°-grado). Tutti quanti hanno lasciato il letto gia' dopo 10 giorni: tutti quanti potevano muoversi bene: la gamba colpita reggeva senza dolori il peso del corpo. Il decorso postoperatorio e' stato notevolmente semplificato e ridotto.

Management of Acute Diseases of the Abdomen

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MATURITY of judgment and experiences of the past decade have tempered the concept of urgency surrounding acute diseases of the abdomen. Haste, hurry and emergency night operations are rapidly losing their pride of place.

For years surgeons have been famed more for their skill than for their judgment; the focus has been on technical procedure, speed, dexterity and nerve. When these were combined with egotism and above all with fluency, the mixture fulfilled the requirements for international acclaim, frequently upon an unstable foundation. The purely anatomic adventure of surgery is receding in importance; a modern surgeon is measured not so much by what he can do as by how much he knows about what he does.

The changing educational concepts by which surgery has become standardized have laid heavy emphasis upon basic training and physiology and have brought about a recession in importance of the purely technical venture. "Urgency" does not carry the same implications as it once did. Emphasis is upon the patient as a whole rather than upon his diseased part, and frequently now the urgency is for restitution rather than for surgical intervention. In the old days, preoperative preparation was unheard of—time was a-wasting! The hallowed halls of medical learning reverberated to the dogma of Lawson Tait: "When in doubt, drain; if still in doubt, multiply the drains!" The idea that the patient himself, as well as his abdomen, might urgently require restitution, was suffering from an international dystocia!

Slowly, with the mounting experience of thoughtful men, questions of propriety began to be asked: Was all this haste necessary? Could not many urgent operations be divided into multiple stages to lighten the burden on the patient? The great era of exteriorization had begun. With it came the Ochsner or delayed treatment of appendicitis; Mikuliez type procedures; delayed secondary resections; spur clamps; multiple stab wounds; innumerable plugs in the form of so-called drains; intravenous injections of saline solution in unprecedented quantities; Fowler beds; rigid immobilization; starvation regimes; prolonged hospitalization; mounting economic costs, and, frequently, subsequent incisional herniations and peripheral thromboses.

Although the economic costs to the patient were high, they were still lower than the cost of a funeral, and the salvage of human lives was greatly increased. An era of thoughtful groping after truth had replaced an era of precipitate action.

This was the era of ileostomy, jejunostomy, colostomy (Paul's tube), peritoneal lavage and, as I remember from my own younger days, learned dissertations advocating a prophylactic ileostomy in all cases of ruptured appendix. This was the era of pressor substances—eserine, pituitrin, acetylcholine, hypertonic saline solution—aided and abetted by numerous and repeated enemas, the constituents of which could only have been devised by a Vienesse chef with a profound knowledge of the spicy riches of the Indies. Much of this has been discarded; much remains.

The current era represents the phase of the surgeon-physiologist. One thinks now not of a perforated stomach, but of a patient with a perforated stomach. It is becoming constantly clearer that "the whole of a man's economy is more important than the part" (Zachary Cope). At this time, therefore, it is wise to spend a few hours in retrospect and assess the value of our successive advances.

The urgency of acute disease of the abdomen is lessened. Early appendicitis, early perforated ulcer and early acute disease of the gallbladder are still urgent, but once they have been endured for more than twelve hours, urgency becomes chiefly a matter of restitu-

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tion, replenishment and restoration, followed by operation, rather than immediate operation and subsequent salvage. Dehydration in cases of acute abdominal disease has assumed a new aspect; surgeons are now aware of blood chemistry and of protein and hematocrit values. Gone are the days of routine intravenous injections of saline and dextrose; volume and quality of injected fluids are no longer matters of guesswork. The individual patient's need is checked by repeated protein, hematocrit and hemaglobin readings; quantitatively neither more nor less fluids are being given, but better fluids, suited in quality and quantity to the exact needs of the moment, are used.

Perhaps the most striking change in treatment of acute disease of the abdomen has centered around the question of drainage. The vast majority of so-called drains are merely plugs. They do not drain; they permit and encourage mixed infection and create permanent fixed points around which subsequent obstructions may occur and through whose channels of exit incisional hernias may develop. For a long time it has been universally accepted that peritonitis is not caused by soiling or spilling at the time of operation or perforation but is due to continued leakage. Consequently, in the acutely diseased abdomen in which peritonitis has developed, if the source is removed or closed the excess secretion aspirated bone dry, and the abdomen flooded with half a million units of penicillin and powdered with an ounce of sulfathiazole crystals, the incision may be tightly closed to advantage without drainage. If patients are immediately rendered ambulatory, continued gastric or Miller-Abbott tube drainage maintained and supportive measures continued, an astonishingly high percentage will recover completely. In 1938 the mortality rate in the United States for general peritonitis under the old regime was 12 per cent; in 1948 it was 4 per cent. Such residual infection as may remain is usually confined to the abdominal wall; once in a while a residual pocketed abscess may develop and require drainage. Drains should be reserved for those cases in which continued soiling is unavoidable and for those in which large tissue spaces are left bare and oozing fluid collections must be evacuated—for example, after amputation of the breast.

Immediate ambulation has supplanted the rigid immobilization of the Fowler bed. Fowler's position, which was of a static nature and which involved difficult nursing problems and discomfort for the patient, has gone, and with it were wheeled out most of the emboli, phlebitis, cystitis, gas pains, thoracic complications and psychic horrors of the stuffed shirt era in surgery.

Acute intestinal obstruction has lost much of its urgency. In no other department of emergency surgery has the need for restitutional care been more emphasized. The small bowel strangulation of twenty-fours' duration was normally fatal even though relieved; the associated dehydration, dechlorination, nitrogen retention, waterlogged intestine, and derangement of the sympathetic nervous system were less clearly understood than was the fact that a segment of bowel was mechanically strangulated. Surgeons were still proceeding by mechanics rather than by physiology.

Wangensteen's suction technic and its multitubular successors, intestinal deflation, parenteral medication and biochemistry have altered all that. It has long been recognized that extensive surgical intervention in the presence of acute obstruction is highly dangerous; less well appreciated is the fact that even primary operation for simple relief of obstruction carries a high fatality rate and is not to be undertaken in haste. A few hours spent in deflating a gas-distended bowel, in emptying a fluid-laden stomach, in restoring a parched capillary bed, in rendering intestinal flora comparatively inert with streptomycin, aureomycin and sulfathalidine, or in restoring the function of the emunctories is time gained, not wasted.

Half forgotten is the prophetic utterance of Lord Moynihan, "We have made surgery safe for the patient, we must now make the patient safe for surgery." This requires an investment; an investment in time—time to assess the patient's depletion and to direct intelligently his preoperative restitutional care, time to deflate and evacuate a dilated stomach. Time spent for these purposes will help to eliminate many impressive operative and anesthetic hazards.

I have always believed in and practiced early removal of the acutely diseased gallbladder, but in the past quarter century the question of acute disease of the gallbladder has

boxed the compass. English and European surgeons have long held the view that the gallbladder with acute disease should be operated upon early. In this country there was a more conservative attitude until the last few years, but at present early surgical intervention is more and more widely accepted.

A well known English surgeon once stated that the acutely diseased gallbladder is no different from the acutely diseased appendix and should be operated on at once. In my opinion the analogy is ill chosen; the appendix has a highly infective cavity with intestinal flora, but the gallbladder cavity in most instances is sterile. Most so-called "acute gallbladders" present obstructive rather than infective disease. Usually a solitary calculus has become impacted in the entrance to the cystic duct. I have taken many cultures of the contents of diseased gallbladders, and in the majority of instances they were sterile. In the minority are those gallbladders which become gangrenous and in which infective pyogenic processes develop. Appendical diseases, on the other hand, are infective from the beginning. In the early stages the acutely diseased gallbladder should be immediately operated on, and so should be the acutely diseased appendix; but for the acutely diseased gallbladder in which the disease has existed for three or four days before being seen, I favor the expectant conservative approach. The urgency for operation has passed; urgency for replenishment and restitutional therapy remains. Patients with diseases of the gallbladder should be carefully watched. If the condition shows progressive day-to-day changes in its overall picture, an advancing infection leading to imminent rupture must be predicated and demands immediate intervention. If it fails to progress, no matter how slow its subsidence, it should be permitted to subside.

For both gallbladder and appendix, a condition that has subsided is always surgical. The most common mistake is too early surgical intervention after subsidence; operation should be delayed for months, not weeks!

Acute perforation of gastric and duodenal ulcers has always been regarded as an urgent surgical emergency. It frequently is, but here again a great change has recently come about. The obvious question is being asked: Are these cases always "rush" cases? Countless cases are on record in which operation was refused or not available. The "forme fruste," or minute perforation sealed with a lymph plaque, heals without intervention. Perforation, however, in the presence of a high acid level, an empty stomach and prompt care, may frequently be treated successfully by gastric syphon drainage, antibiotics and constitutional support. The patient with a low acid level, a full stomach, an extensive fluid leak, flank dullness, and large quantities of free air is always in need of surgical intervention. Each case must be a law unto itself.

However, even here there is doubt as to which should be done, simple closure or resection. In America simple closure is the rule; in Europe, immediate resection has been the policy of choice for some years. Likewise, an opinion has been widely current that perforation cures an ulcer. Perforation does nothing to alter the ulcer diathesis, but I have found that it is usually an acute ulcer that openly perforates, that roughly one-third of all such ulcers are cured by their perforation and closure, that one-third require continued constant medical care and that one-third require subsequent resection.

Undoubtedly there are instances of small perforations, chronic ulcers with minimal leaks, high acid levels, and mobile stomachs, all under the very best auspices, in which primary resection of a free perforated stomach is justifiable. My opinion, however, is that in these days of high safety in elective surgical procedures, a better time might be found to resect a stomach. Simple closure and subsequent resection (if necessary) would seem to me to be the part of wisdom.

Many an innocent abdomen has been opened because of a hasty diagnosis of coronary occlusion. The ability to distinguish clearly the difference between pain and tenderness is important. Pain is a symptom, and any part of the neurologic tree in which it occurs may feel the pain of even remote viscera, but tenderness must be elicited by the examiner, and persistent localized tenderness is never present in the abdomen in the case of uncomplicated coronary occlusion. The rewards here go to the unhurried investigator!

Irradiation of the acutely diseased abdomen

is a widely used and vastly neglected field. Frequently, or even usually required at night, it is commonly relegated to junior technicians and suffers from amateur interpretations. Probably the most widely known phenomena —laddered loops, free air, and fluid levels— are not too difficult to interpret; but coincident thoracic plates of children, diaphragmatic fixation or mobility and the many other investigative features that are best diagnosed by fluoroscopic means, especially in the seriously ill, warrant the immediate services of experienced roentgenologic personnel thoroughly prepared to do interpretive work.

Probably nowhere is such a service more valuable than in the interpretation of injuries of an acutely traumatized abdomen. Herein lie some difficult decisions. This is no place for hasty or ill considered pronouncements; there are no formulas or catch phrases to help in the decision. Nowhere does maturity of judgment and experience carry greater rewards.

The question paramount is, of course: Is there or is there not a hollow viscus ruptured? If there is, as soon as due assessment has been made of shock, hemorrhage and other forms of depletion, it must be repaired. Not so with solid viscera! It is, or should be, an axiom that no massive internal hemorrhage can be surgically approached until adequate measures of restitution have been undertaken. If a ruptured spleen or liver is bleeding badly, the patient is in no condition to undergo operation. If the hemorrhage has stopped, he no longer requires it; posture, hypothermia, hyperoxygenation and sedation are best. As soon as the bleeding has closed, slow drip transfusions of centrifuged blood cells from which the bulk of serum has been removed—blood sludge—quality without volume, should be given almost continuously. I am opposed to massive multiple transfusions for freely bleeding patients. Uninfected blood is rapidly absorbed from the peritoneal cavity, and the autotransfusion does no harm. The packing of a crack in the liver from which bleeding has already stopped is gross surgical interference. The subsequent opening or aspiration of residual pockets of fluid or abscesses is much safer. When massive hemorrhage coexists with perforation of a hollow viscus, there are no formulated rules. The same principle applies to ruptured ectopic pregnancy. Once rupture with severe hemorrhage has occurred, the major urgency has passed; it is the condition prior to rupture that is urgent! I have treated thirty-three successive ruptured ectopic pregnancies conservatively, without operation and without mortality; two pelvic abscesses required subsequent drainage.

Nowhere in the surgical field does one see the effect of the newer teaching more clearly than in the handling of the acutely diseased abdomen. Although there is nothing more fascinating than to watch a master craftsman at work, whether he is shoeing horses, repairing dentures or operating on the common duets, the day has passed when a man can gain plaudits through dexterity alone. The old skills have not suffered devaluation, but something new has been added: Modern blood and plasma banks, the splendid fortification of modern anaesthesia, antibiotics, and mechanical suction drainage have given time for more thoughtful surgical approaches. More surgeons are both educated and skilled; fewer are merely skilled.

Urgency is still with us—but urgency tempered with preparedness, guided by a surgeon who is more anxious to cure than to operate. Dante, writing his "Divine Comedy" five hundred years ago, might have had a preview of the modern concept of abdominal surgery when he said, "The mouse has fallen amongst less hungry cats."

SUMMARY

The author discusses past and present concepts of abdominal surgery, with particular attention to acute disease of the appendix and of the gallbladder. He emphasizes the altered concept of "urgency" as applied to these organs, recommending conservative and restorative treatment of many conditions formerly thought to require immediate operation.

RÉSUMÉ

Comparaison des opinions passées et présentes quant à la chirurgie abdominale particulièrement en ce qui regarde les états pathologiques aigüs de l'appendice et de la vésicule biliaire. L'auteur souligne le revirement d'opinion au sujet de 'L'opération

d'urgence" et recommande le traitement conservateur et fortifiant pour beaucoup de maladies qui, à ce que l'on croyait jadis, exigeaient l'opération immédiate.

RESUMEN

El autor examina los conceptos pasados y presentes de la cirugía abdominal con especial atención a las afecciones agudas del apéndice y de la vegiga biliar. Analiza también la variación del concepto de "urgencia" en referencia a estos órganos, recomendando el tratamiento conservador y restaurativo de muchos procesos que anteriormente se pensó que requerían una intervención inmediata.

RIASSUNTO

Discute i vecchi ed i nuovi concetti sui quali si basa la chirurgia addominale, con particolare riguardo alla cistifellea ed all'appendice. Richiama l 'attenzione sopra il modificato concetto dell " 'urgenza," raccomandando in molte condizioni che venivano—nel passato—ritenute urgenti per l'operazione un trattamento conservativo.

Recent Honors

Dr. Wallace Graham, F.I.C.S., Washington D. C., and Dr. William Randolph Lovelace, F.I.C.S., First Vice-President of the United States Chapter of the International College of Surgeons, have been elected Honorary Fellows of the Peruvian Academy of Surgery.

Dr. Federico E. Christmann, F.I.C.S., of the Argentine Chapter, has been elected Foreign Correspondent of the same organization.

Prof. Dr. Enrique Hertzog, F.I.C.S., Regent of the Bolivian Chapter of the International College of Surgeons and Ex-President of the Republic of Bolivia, has been appointed Ambassador from Bolivia to Spain.

Prof. Dr. Manuel A. Manzanilla, F.I.C.S. (Hon.), Vice-President of the International College of Surgeons, has been elected Vice-President of the National Academy of Sciences of Mexico.

Dr. Oswaldo Pinheiro Campos, F.I.C.S., Ex-President of the Brazilian Chapter of the International College of Surgeons, has been elected President of the Brazilian Society of Orthopedics and Traumatology.

Neuralgic Pain Wrongly Ascribed to Posterior Hernia of Intervertebral Discs

Report of Two Cases

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IN this paper I shall try to prove that there are posterior hernias of the intervertebral discs which are not responsible for the painful symptoms that sometimes coexist with them.

After popularization of the concept that hernia of "nucleus pulposus," protruding in the spinal canal, was the cause of low back pain and sciatic pain, there was an exaggerated use of surgical treatment to eradicate the hernia. This was followed by many therapeutic failures and by a certain disbelief that posterior hernia of the intervertebral discs could have the pathogenic importance at first attributed to it.

A retrospective analysis of the anatomic studies of Virchow in 1857 and Ribbert in 1911 has shown the great frequency of protrusion of the intervertebral disc. The observations of Schmorl and Andrae showed that, although some neuralgic pain of the lower part of the back and of the legs may have this origin, not all such pain can be so accounted for.

Recently the number of papers on the subject has increased in all medical centers of the world. At the first South American Congress of Neurosurgery, held in Montividéo, Uruguay, in March 1945, the subject was fully discussed.

As I consider this etiologic concept exaggerated, I presented a paper entitled "Hernias Posteriores Dos Nucleos Pulposus Dos Discos Intervertebrais" to the first "Jornada Brasileira de Radiologia" held in São Paulo, Brazil, and to the Peruana Academy of Surgery in Lima, Perú. In this paper I stated that the aforementioned diagnosis is possible only with the aid of perimyelographic or cineperimyelographic study of the material removed at the operation.

Soon afterward I had opportunity to treat this condition in several new cases. This experience confirmed my belief, and in this paper I present proved cases in which hernia was present, protruding into the spinal canal, but was not responsible for pain, which was relieved by treatments irrelevant to the hernia.

From the Service of Neurology and Neurosurgery of Santa Casa, Dr. Carlos Gama, Chief.

REPORT OF CASES

CASE 1.—J. C. F., a white Brazilian farmer aged 61, married, was examined on Aug. 30, 1948.

History.—Since 1918 the patient had had pain in the lower part of the back and bruits in the backbone on movement. In 1926 there were violent muscular contractions followed by subcutaneous suffusions in the same region. For a year the chief complaint was of pain in the left foot, described as "biting" and accompanied sometimes by difficulty in micturition. For twenty-five days he had been given local treatment (hot air and roentgen irradiation of the spinal column).

Examination.—There was thoracic kyphosis. The patient assumed an antalgic attitude, avoiding the placing of his body weight on the left leg. The left gluteal fold was at a low level. There was reduced tonus of the gluteus quadriceps muscle and the left calf. The left achilles reflex was abolished. On the right side it was present but weak. "Stitch pains" in the left knee and sole were noted. Tactile, thermic and dolorous hyperesthesia was observed at the level of the fifth lumbar and the first sacral vertebrae on the left. The Valleix points were tense and painful on the left sciatic nerve. The Kerning and Lasegue signs were absent.

Perimyelographic Study: On August 30, with the patient under fluoroscopic examination (with lipiodol), in the posteroanterior, ventral decubitus and profile positions, a herniation was revealed between the third and the fourth lumbar vertebrae (Fig. 1).

First Operation.—On September 2, operation was performed for hernia of the disc, with section

of the spinous apophysis of the fourth lumbar vertebrae and partial section of those of the third and the fifth. The left side of the arch was excised from the third and fourth lumbar vertebrae. The presence of the intraspinal obstacle that elevated the nerve root was confirmed. Curettement was performed, the root being spared. The dura mater was opened and was flooded with liquid fat (lipiodol?).

The patient's postoperative condition was good. A follow-up examination on September 10, the patient having complained of persistent symptoms and a dormant sensation in the left foot, showed reduction of the anesthetic area. The patient's walking was improved. High voltage roentgen treatment was administered to the spinal column, and massage of both legs was ordered.

Another examination, on September 21, disclosed a hard nodule and pain of deep origin, referred to the foot. The nodule was located in the sciatic nerve in the lower third of the thigh. A biopsy was performed, and pathologic examination showed a neurinoma (Verocay) or a perineural fibroblastoma (Penfield).

Second Operation and Postoperative Course.—On September 25, with intravenous sodium pentothal anesthesia, operation for a neurinoma of the left sciatic nerve was performed. The tumor was excised, and a terminoterminal neurorrhaphy was performed. The patient was immobilized in a position of flexion (Fig. 2). On October 15 he was discharged to his home. On May 4, 1949, he asked for alcoholization of the sciatic nerve, a procedure I condemn. I suggested instead a crossed anterolateral cordotomy to relieve the pain. The patient consulted another surgeon, who exposed the sciatic nerve at the level of the former operation and performed perineural alcoholization. On November 14 the patient returned to me, showing retraction of the left leg with intense amyotrophy, tendinous retractions and pseudoankylosis of the coxofemoral joint and the knee joint. Crucial pains in the lower

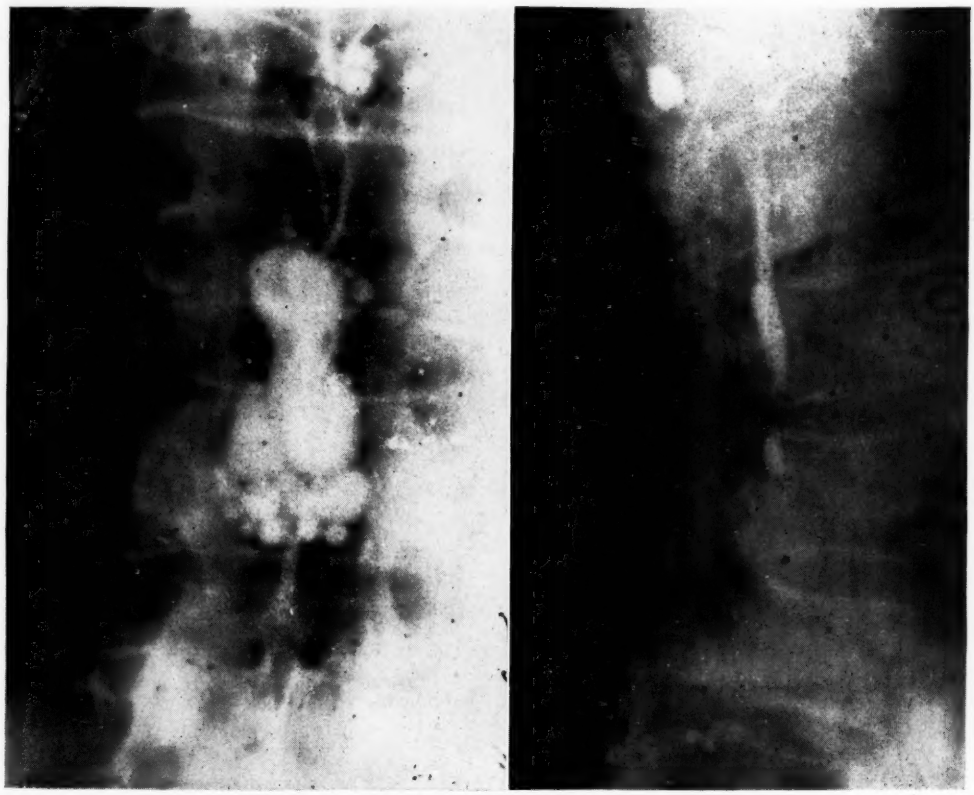

Fig. 1.—Herniation between third and fourth lumbar vertebrae.

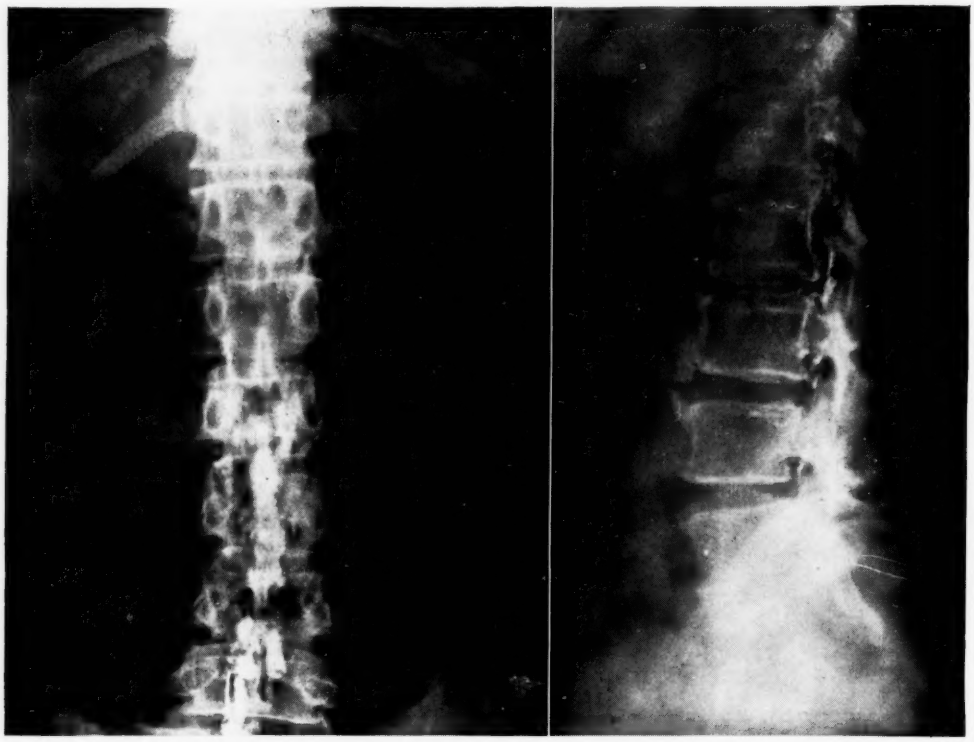

Fig. 2.—Roentgenograms of September 25, 1948.

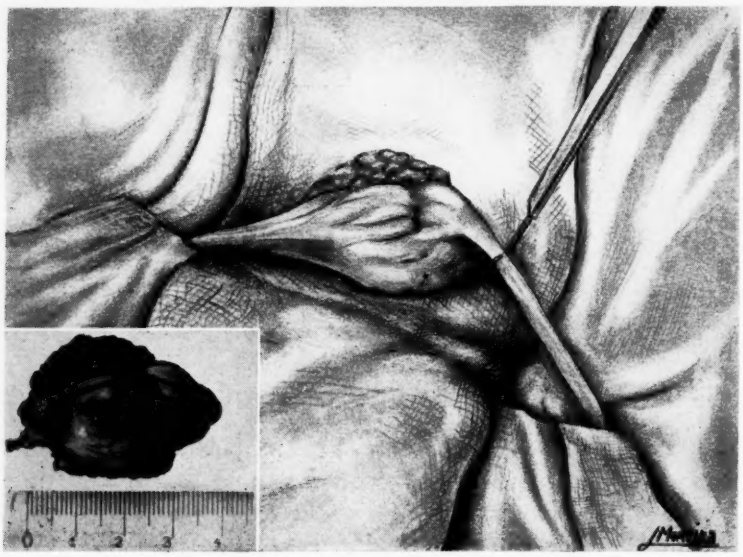

Fig. 3.—Operative technic. *Inset,* operative specimen.

part of the back and the left leg were present. The patient had become addicted to morphine.

Third Operation.—On November 15 a crossed anterolateral cordotomy was performed at the level of the sixth thoracic vertebrae.

Result.—The postoperative course was satisfactory, aided by elimination of narcotics, massage of the legs and mobilization of the joints. At the time of writing the patient is in excellent condition and able to walk with a cane. The mobility of all joints has been preserved.

CASE 2.—On Dec. 19, 1949, P. I., a white Brazilian widower aged 62, an industrial worker, was admitted to my service.

History.—In 1935, during a flexion movement of the body, the patient suffered an acute pain in the backbone accompanied by impairment in walking. From that time onward such crises occurred frequently. During the month just past he had suffered pain in the lower part of the back, starting in the gluteal region, radiating down the leg past the dorsal aspect of the knee and continuing to the ankle. Coughing or sneezing increased the low dorsal pain.

Examination.—The patient was in a state of numbness resulting from injections of morphine. Deep reflexes could be elicited in the lower part of the left leg. The Babinski reflex was present bilaterally. Slight pains were produced by pressure on the left sciatic nerve. No pain resulted from pressure or percussion of the lumbar and sacral spinal apophyses.

Cerebrospinal Fluid: The following data were obtained: initial pressure, 11; final pressure, 7; chloride, 7 Gm.; dextrose, 0.61 cg.; proteins, 0.4 cg.; cells, 0.6 per cubic millimeter; blood cells per cubic millimeter, 10. The Stockey test revealed good permeability of the spinal canal. The Pandy, Nonne and Weichbrodt, Eagle, and Steinfeldt tests gave negative results, as did a test for *Cysticercus.*

Perimyelographic Study: This was performed with a lumber injection of 3 cc. of pantopaque, with the patient in the decubitus dorsalis position, on November 23. Fluoroscopic examination revealed that the contrast medium, with the patient in the Trendelenburg and ventral positions, stopped between the third and the fourth lumbar vertebrae. Chronic spondylitis, numerous osteophytic formations and deformation of the vertebral bodies were observed (Fig. 3). Twenty-four hours later, new roentgen plates showed intense funiculitis of the left lumbar roots, most intense at the second and third levels (Fig. 4).

Treatment.—High voltage roentgen therapy was administered to the spinal column. After the second application the pain disappeared and the patient returned to his activities in good condition.

SUMMARY

In the first case the presence of posterior hernia of the intervertebral disc was proved by roentgenologic and histologic examination of the material excised at operation, demonstrating the presence of physalides in the midst of the collagenous tissue. The patient failed to improve after the operation because a neurinoma existed in the left sciatic nerve. Wrongly, alcoholization of the nerve was done, and this resulted in neuritis with its consequences. Because of the excruciating pain and because the patient had become addicted to morphine, a crossed anteriolateral cordotomy was subsequently performed and enabled the patient to recover with the help of massage and calisthenics.

Fig. 4.—Funiculitis of left lumbar vertebral roots, intensified at second and third levels.

Case 2 suggests the posterior hernia accompanied by a spondyloarthritic process of the lumbar column. Examination of the cerebrospinal fluid demonstrated a high protein level. Roentgen examination showed protruding hernia of the disc of the third and fourth lumbar vertebrae, and some plates showed the contrast medium penetrating the root-sheaths of the left sciatic nerves, demonstrating radiculitis. Roentgen therapy was administered, and in twenty-four hours the pain disappeared.

RÉSUMÉ ET CONCLUSIONS

La découverte d'une hernie postérieure du disque intervertébral ne démontre pas que celle-ci soit la cause de douleurs du bas du dos et de sciatique. La hernie du disque peut exister en même temps qu'une autre lésion et cette autre lésion peut en être responsable. Dans les cas cités ici, l'excision de la hernie ne fit pas disparaître les douleurs. Lorsqu'une autre lésion existe, elle devrait être traitée avant d'entreprendre l'intervention chirurgicale. La méconnaissance de ce fait contribue au manque de confiance qui existe envers le traitement chirurgical de cette lésion.

RESUMEN Y CONCLUSIONES

Aunque se observe una hernia posterior del disco intervertebral, ello no prueba que el mismo sea la causa del dolor lumbar y del dolor ciático. La hernia del disco puede coincidir con cualquiera otra lesión y esta otra lesión puede ser la responsable. En los casos presentados por el autor la resección de la hernia no tuvo valor en cuanto a aliviar el dolor. Cuando existe una lesión adicional debe tratarse antes de practicar una intervención. La falta de comprensión de estos hechos contribuye a macer perder la confianza en los resultados del tratamiento quirúrgico de esta afección.

RIASSUNTO

La dimostrazione di un 'ernia posteriore del disco intervertebrale non e' una prova sufficiente per attribuire all'ernia la responsabilita' dei dolori sacrali e dello sciatico. L'ernia del disco puo' infatti coesistere con numerose altre lesioni, le quali sono responsabili dei dolori. Nei casi descritti dall'A. l'escisione del disco non ha—per esempio—influito sopra i dolori. Se esistono altre lesioni, queste vanno curate prima dell'operazione. Le deficienze diagnostiche sono responsabili della mancanza di fiducia nella cura operativa delle ernie dei dischi intervertebrali.

In Praise of Famous Men

From time to time there appear on the earth rare and delightful men of resplendent virtue whose eminent qualities shed a wonderful luster about them. They are like those marvelous stars, of the origin of which we know nothing, while we know still less what will become of them after they have disappeared. They have neither forebears nor descendants; they are a race in themselves.—*La Bruyere*

Great men are like meteors, which shine and consume themselves to enlighten the earth.—*Napoleon*

Great men and insignificant men have like accidents, like vexations and like passions; but the former are on the outside of the wheel and the latter near the center, and are therefore less agitated by the same movements.—*Pascal*

No man ever yet became great by imitation.—*Johnson*

The Use of Radioactive Iodine in Hyperthyroidism

A Report of Three Cases Unsuccessfully Treated

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WITHIN a period of three weeks I recently examined, and later operated upon, 3 patients with exophthalmic goiter, who had been unsuccessfully treated by radioactive iodine (I^{131}). As far as I know, this is the first report of its kind to appear in the literature. Numerous reports of various groups of investigators, among them Soley, Miller, and Foreman, Haines, Keating, Power, Williams, and Kelsey, Chapman and Evans, and Hertz and Roberts, dealing with the effect of radioactive iodine therapy in cases of thyrotoxicosis, have been presented. These papers were given at the American Goiter Association meetings in 1948 and 1949.

The reports of these investigators were fair and pointed out the fact that longer periods of observation would be required before definite conclusions could be formulated as to the ultimate effectiveness of this form of therapy. Surgeons have long since learned not to speak of a two-year cure of cancer, and, in the same sense, one does not speak of a cure of exophthalmic goiter. Yet, in discussing toxic adenomas, the term "cure" may be used correctly, for it is extremely rare that this type of goiter recurs after subtotal thyroidectomy performed by a competent thyroid surgeon. The same is not true of exophthalmic goiter. This disease may recur five, ten, or even twenty years after an apparently successful operation. It is questionable whether one is justified in using the term "cure" with regard to this type of hyperthyroidism. It might be preferable to say, as of tuberculosis, that the disease is arrested.

Most investigators have had an opportunity to observe the effect of radioactive iodine for a period of three or, at most, four years—not a sufficient time to justify pronouncing these patients cured. Nor can the term "cure" be used of patients who have adenoma with hyperthyroidism and are treated with radioactive iodine. The hyperthyroidism may be brought under control, but the adenomas are still present and, as such, are a potential source of malignancy or may become intrathoracic and lead to cardiac or respiratory embarrassment.

The reports of those working in this field indicate that a high percentage of patients respond successfully to this treatment. Most investigators frankly admit, however, that all patients do not respond favorably and that failures do occur. It is claimed that the percentage of failures is so low as to make this method preferable to surgical treatment with its possible complications. One excellent young surgeon, who has been especially enthusiastic in his endorsement of radioactive iodine, has said that if he were the patient and were ten years older he would prefer treatment with radioactive iodine to surgical treatment. This implies that he is not sure that the radioactive iodine might not lead ultimately to the development of cancer. This fear is lessening, since no malignant developments have been reported to date.

Not all reports of investigators have been conservative. Unfortunately, in 1947, the colored supplements of the Sunday newspapers from coast to coast contained an article picturing a woman drinking a glass of orange juice containing a few drops of radioactive iodine and curing her goiter. This paper was brought before the officers of the American Goiter Association at the Chicago meeting, and the author was condemned for the unethical article and its deleterious effect on the medical profession and the laity.

Another investigator reported to both lay and medical organizations that a large series of cases had been successfully treated without a single failure. This is not correct, according to statistical studies of the late Dr. Mayo Soley and his former associate, Dr. E. R. Miller. In a paper presented at the meeting of the American Goiter Association in Toronto, these

From the Jackson Clinic, Madison.

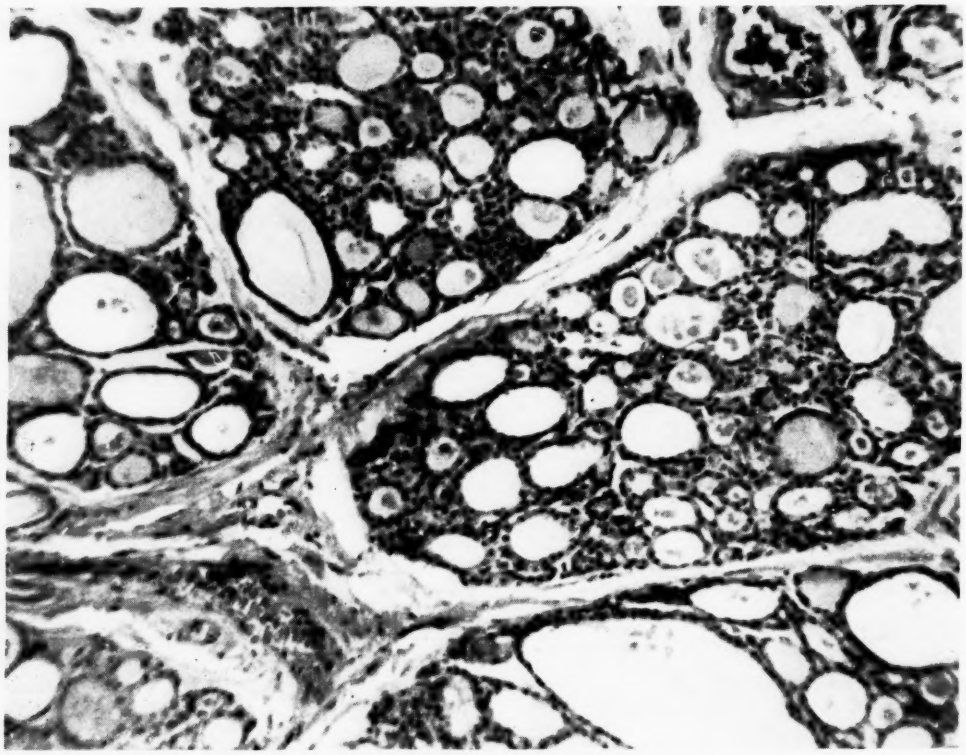

Fig. 1.—Pathologic specimen.

two scientists reported that in a series of 46 thyrotoxic patients treated with radioactive iodine from 1944 to 1948 there were 42 satisfactory and 4 unsatisfactory responses. The latter were believed to be due to a conservative approach to therapy in the early phases of the study. It should be noted that these investigators used the term "response," not "cure." They further qualified their report by stating that radioactive iodine in adequate dosage will destroy subtotally the hyperfunctioning thyroid in a patient with Graves' disease and thereby usually produce a satisfactory remission of the symptoms and signs of hyperthyroidism. They expressed the opinion that further studies would ultimately disclose its place in the therapy of Graves' disease. These capable scientists obviously singled out Graves' disease in contrast to toxic adenoma and, in their conservative manner, used the words "usually" and "remission."

Nearly two years have elapsed since that report, and one wonders how their opinion has been modified. At the last meeting of the American Goiter Association, held in Madison in 1949, Doctor Soley was asked to summarize the present status of radioactive iodine. He stated that the total experience of all American investigators included 475 thyrotoxic patients. Good results were reported in 83 per cent of 288 cases; fair results in 9.7 per cent, and failures in 5.5 per cent.

These statistics were tabulated as follows:

	Before Treatment	After Treatment
Thyroid weight	43 Gm.	20 Gm.
BMR	+37 %	+3%
PBI	11.8Y%	6.5Y%
Average total dose	I^{131}	6920 YC
Time required for return to normal		4.9 mo.
Post Rx hypothyroidism and myxedema		8.5%

It was thought that exophthalmos progresses less than after subtotal thyroidectomy and more than after roentgen therapy.

It is regrettable that such a brilliant and honest investigator should be lost to the medical profession at a time when so much uncertainty exists regarding the correct status of radioactive iodine.

At San Francisco I recently had an opportunity to hear a splendid symposium on the subject of hyperthyroidism and later to enter the discussion. Among the speakers were Dr. Robertson Ward, surgeon, and Dr. E. R. Miller, who is one of the pioneers in the field of radioactive iodine. The latter stated that approximately 20 per cent of the patients treated were in the unsatisfactory group. Moreover, he indicated that, in his opinion, radioactive iodine in the future would prove more valuable from a diagnostic than from a therapeutic standpoint.

Having lived through the "pre-Lugol era," the days of hot water injections, the period of ligation and stage operations, and the rise and fall of roentgen therapy and of thiouracil, I am beginning to wonder if the first wave of overenthusiasm for radioactive iodine is not passing. Possibly more experience has shown that cure of exophthalmic goiter with this agent is not as simple as was at first reported. Haines and his associates reported from their studies at the Mayo Clinic that much more experience is needed before confidence can be placed in the accuracy of estimated doses. They stated that, although the ability of this substance to control severe exophthalmic goiter at least temporarily seems definite, it is far too early to draw definite conclusions. They pointed out that the incidence of both myxedema and recurrence of exophthalmic goiter after treatment is much higher among their patients treated with radioactive iodine than among those treated surgically.

At another great thyroid center, the Lahey Clinic, there has been no attempt to substitute this form of therapy for thyroidectomy. Why? Because the surgical treatment of hyperthyroidism has been so simplified by the use of such agents as Lugol's solution for exophthalmic goiter and propylthiouracil for toxic adenoma that surgical mortality has been virtually eliminated in the hands of the experienced thyroid surgeon. Nor is there any occasion for surgical complications to occur when thyroidectomy is performed by a careful surgeon. Granted that operation is not the ideal way of treating Graves' disease, it is probably, at present, the quickest and most effective method of restoring the patient to normal health.

My experience with radioactive iodine is limited to 3 patients—certainly a small series; and yet a significant one, in that all 3 patients had been unsuccessfully treated and came to operation as a result. Two had received two treatments over a six-month period, and one had been given four treatments in nine months. The condition of all had become progressively worse. They had lost an average of 25 pounds (11.3 Kg.) in weight, had suffered progressive exophthalmos and had sustained some myocardial damage. These patients reminded me of those treated by roentgen therapy in the twenties, the disease being partially checked

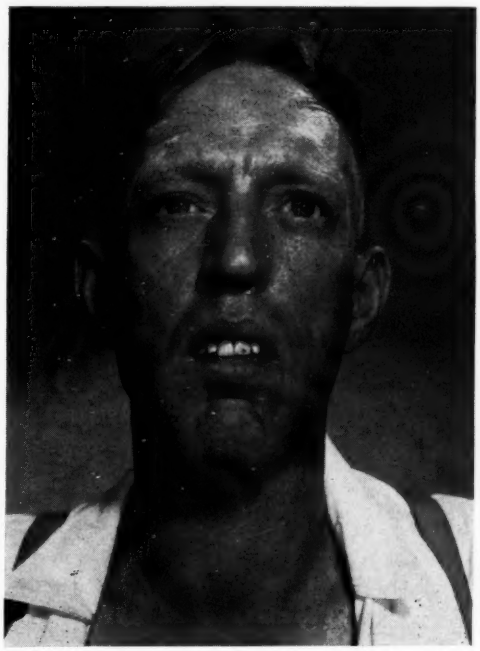

Fig. 6.—Patient with exophthalmic goiter nine months after starting treatment with radioactive iodine. Weight loss, 50 pounds (22.7 Kg.); basal metabolic rate, plus 68 per cent; pulse rate, 116.

at first, only to grow progressively worse with time.

The 3 patients were prepared for operation in the usual manner, each receiving 30 drops of Lugol's solution daily for ten days. The following observations may or may not prove significant and of importance to other surgeons called to operate upon these patients. The operations were more difficult than is the case with patients to whom radioactive iodine has not been administered. The glands were extremely vascular, like those of patients prepared with propylthiouracil or those observed in the "pre-Lugol era." The first patient had a moderately severe reaction the first day, but the second night he became toxic, the pulse rate rising to 140 and the temperature to 104 F. This was the nearest approach to a crisis that I have observed in ten years and indicates that these patients must be carefully watched for this possible dangerous reaction. His condition was brought under control within a few hours by large doses of Lugol's solution given orally.

In 1926 I had the misfortune to operate upon a patient with exophthalmic goiter who reacted in a similar way. This patient had received Lugol's solution for six months from her physician and appeared in satisfactory condition for surgical treatment. After thyroidectomy a fatal crisis developed. At the 1928 Denver meeting of the American Goiter Association attention was called to this unfortunate result, the prolonged use of iodine was condemned, and the term "iodine-fast" suggested for this condition. Despite repeated warnings by many other surgeons and myself, some physicians still persist in treating these patients over long periods in the hope of arresting the disease. Fortunately, these patients may now be given a preliminary rest period with propylthiouracil.

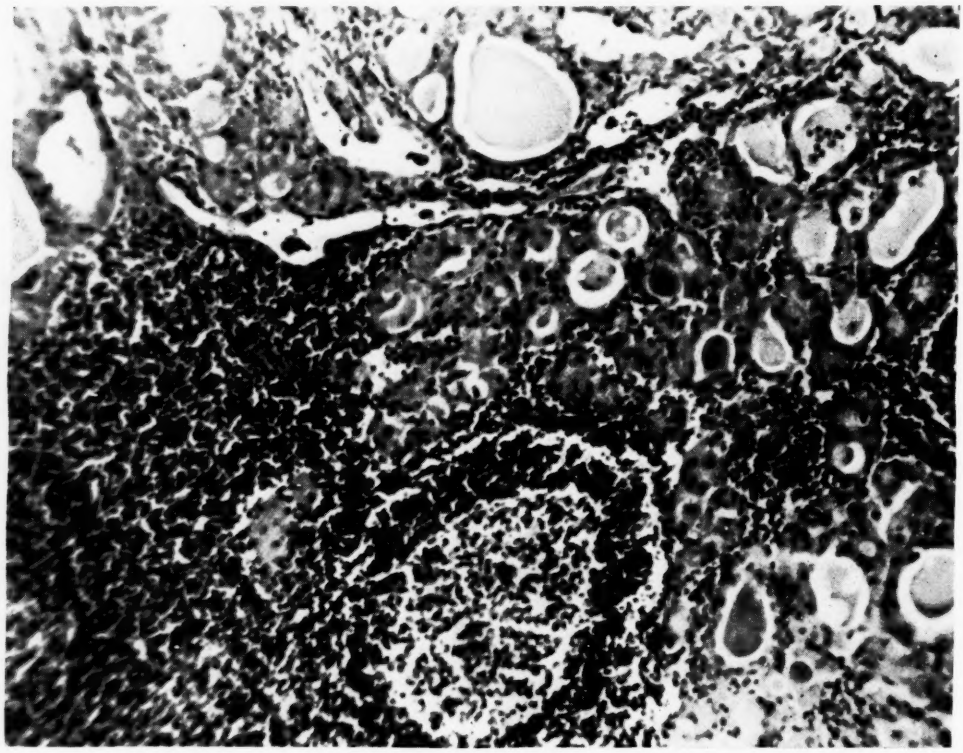

Fig. 2.—Pathologic specimen.

That is what was done in the third case of this series, a six weeks' course of propylthiouracil being administered before the usual preoperative ten-day preparation with Lugol's solution. At operation the gland was less vascular, and there was only a moderate postoperative reaction. In the second case vascularity was marked, but the postoperative course was not severe.

Three cases are too few from which to draw any conclusions, but, since I believe they are the first to be reported, it seems important to call attention to them.

REPORT OF CASES

CASE 1.—A 34-year-old man came to the Jackson Clinic on Dec. 7, 1949, complaining of nervousness, loss of weight and palpitation of one year's duration. He stated that one year before admission he became extremely nervous and noticed that his eyes were becoming prominent, that he perspired excessively, and that his heart pounded a great deal. Since that time he had lost 50 pounds (22.7 Kg.) despite a ravenous appetite. A coarse tremor of the outstretched fingers had been noticed. Nine months before admission he had entered another institution for an operation on his nose. At that time the basal metabolic rate had been taken and was "very high." He was then given a dose of radioactive iodine and "assured he would be well soon." For three months he felt considerably improved. Five months after the initial dose of radioactive iodine he received another, and for a month he felt better. Then he began to feel much worse and to lose weight rapidly. On slight exertion he noticed dyspnea.

On admission he said he had been drinking six cups of coffee and smoking a package of cigarettes a day. This was immediately stopped. Stimulants and exophthalmic goiter do not mix well. Examination revealed the patient to be in an advanced state of hyperthyroidism. He was jittery, making many "purposeful movements without any purpose" (Plummer). Exophthalmos was grade 1 on the right and grade 2 on the left. Tremor, grade 2, was present. The skin was warm and moist. There was quadriceps loss, grade 2. The thyroid gland was symmetrically enlarged and soft; no nodules were palpated, and no thrill or bruit was present. The blood pressure was 142 systolic and 72 diastolic; pulse, 116; weight, 166 pounds (83 Kg.), and the basal metabolic rate was plus 68 per cent. Laboratory studies otherwise gave negative results.

The diagnosis was exophthalmic goiter unsuccessfully treated with radioactive iodine. Thyroidectomy was advised. He was sent home for twenty

Fig. 4.—Patient with exophthalmic goiter with progressive exophthalmos after four doses of radioactive iodine. Basal metabolic rate, plus 44 per cent; pulse rate, 89; weight loss, 33 pounds. (15 Kg.).

days' preparation with Lugol's solution, 10 drops three times a day. On Dec. 28, 1949, a subtotal thyroidectomy was performed, with superficial nerve block anesthesia. Operation was tedious because of the extreme vascularity and friability of the gland, which resembled those of the "pre-Lugol" era. Convalescence the first day was not unusual, but on the second evening, despite large doses of iodine, his temperature rose to 104 F. and his pulse rate to 160. Within a few hours this was brought under control with more iodine.

The pathologic report showed the specimen to consist of two pieces of thyroid tissue weighing 30 Gm. and measuring respectively 4.5 by 4 by 2 and 4 by 3.5 by 1.5 cm. One surface of each was covered by a thin connective tissue capsule. The opposite surfaces were of pale yellowish red, lobulated thyroid tissue. The cut surfaces were similar. They were less moist than average. Microscopically the sections showed lobules of thyroid tissue divided by narrow fibrous connective tissue septums. The lobules contained acini of variable size, some of which were lined by flattened cuboidal epithelium and contained deeply acidophilic cytoplasm. Other acini, some within the same lobules, varied from very small, non-colloid-containing acini lined by tall cuboidal epithelium to moderately large acini lined by similar epithelium but containing pale staining, finely granular colloid often separated

Fig. 5.—Patient with exophthalmic goiter after treatment with two doses of radioactive iodine. Basal metabolic rate, plus 69 per cent; pulse rate, 92; weight loss, 39 pounds. (17.7 Kg.).

from the epithelial surface by vacuoles. Papillary infolding of the epithelial lining was inconspicuous. There was a very sparse lymphocytic infiltrate in a few of the lobules and adjacent portions of the septums. There was also an occasional collection of lymphocytes forming a small follicle. The diagnosis was epithelial hyperplasia of the thyroid.

The patient was discharged to his home physician's care on the fifth day. On Jan. 10, 1950, he returned, and a weight check showed a gain of 11 pounds (5 Kg.) since his admission date. The pulse was 98, and the basal metabolic rate was plus 27 per cent. The patient was advised that, because of the extreme vascularity of the gland and its pathologic appearance, he must take good care of himself if he wished to regain his health. He was directed to continue with Lugol's solution, 5 drops three times a day, and told to return for another basal metabolic test in a month. The patient stated that he already felt greatly improved, that his heart no longer bothered him, that he was sleeping well, that his tremor was gone and that he was much less nervous.

CASE 2.—A woman aged 60 was admitted to the Jackson Clinic on Dec. 19, 1949, stating that she had not been well for nine months. She had lost 35 pounds (15.9 Kg.) despite a ravenous appetite, was extremely nervous, perspired excessively, was dyspneic on exertion, complained of palpation and of weakness in the legs on climbing stairs, and had noticed a tremor of the hands. Her physician had given her a basal metabolic test, and, finding the rate high, had referred her to another physician for radioactive iodine therapy. She had received her first dose in August and had felt improved for a month, in that she had been less nervous and had stopped losing weight. In November she had received another dose of radioactive iodine, from which "no improvement was noticed."

Examination on admission revealed a symmetric enlargement of the thyroid gland, grade 1 plus. No thrill or bruit was present. No nodules were palpated, and there was no exophthalmos. There was tremor, grade 2, and quadriceps loss, grade 3. The blood pressure was 150 systolic and 80 diastolic; the pulse rate, 92; the basal metabolic rate, plus 69 per cent; and weight, 126 pounds (normal weight, 165 pounds). Other laboratory tests revealed no abnormality.

The patient was given Lugol's solution, 10 drops three times a day for eighteen days, as a result of which the basal metabolic rate dropped to plus 47 per cent. A subtotal resection was performed on Jan. 6, 1950. The gland was again found to be extremely vascular, making the operation technically more tedious and difficult than usual. There was no marked postoperative reaction.

Pathologic examination showed the specimen to consist of three pieces of thyroid tissue weighing 8 Gm. and measuring 1.4 by 1 by 0.6, 2.3 by 1.8 by 1.4, and 3 by 2.2 by 1.4 cm. One surface of the two larger pieces was covered by fibrous connective tissue capsule roughened by fibrous tags and lobules of fat. Section showed pinkish tan, coarsely lobulated, moderately dry cut surfaces. There were several small pale gray foci scattered throughout the glandular tissue. Microscopically the sections of the thyroid for the most part showed small lobules separated by narrow connective tissue septums. The lobules contained small to moderate-sized glands lined with low cuboidal epithelium and containing colloid. One section contained a well circumscribed nodule surrounded by a dense collagenous connective tissue capsule. The glands making up this nodule were smaller than those of the normal lobulated tissue. Occasionally they were separated by large irregularly shaped spaces lined with tall cuboidal epithelium. In the central portion of this nodule was a focus of fibrous tissue containing many acicular slits and an occasional giant cell. Included cross sections of thyroid arteries showed their walls to be thickened and to contain an undulating line of calcium immediately beneath the intima. The diagnosis was microfollicular adenoma of the thyroid showing focal fibrosis.

The patient was discharged on the sixth day. She was still nervous and jittery but improving. Four days later she stated she was much less nervous, that her heart no longer pounded, and that she was sleeping well.

CASE 3.—In September 1948 a 52-year-old woman consulted a physician because of a weight loss of 33 pounds (15 Kg.) in six months. At that time she had a ravenous appetite, complained of palpitation and had marked prominence of the eyes. The basal metabolic rate was then plus 70 per cent. She was referred for radioactive iodine treatment and received a total of four doses. At first she gained 8 pounds (3.6 Kg.); then the weight remained constant for six months. She noticed less palpitation and nervousness, but exophthalmos progressed. There was some blurring of vision, and sometimes her eyes did not focus.

She was admitted to the Jackson Clinic on Nov. 17, 1949, and a diagnosis was made of exophthalmic goiter unsuccessfully treated with radioactive iodine. Examination revealed a symmetrical enlargement of the thyroid gland, grade 2; no thrill or bruit; warm, moist skin; tremor, grade 2; exophthalmos, grade 3; basal metabolic rate, plus 44 per cent; pulse rate, 84; blood pressure, 174 systolic and 88 diastolic; quadriceps loss, grade 2; hemoglobin, 78 per cent; erythrocyte count, 4,030,000, and leukocyte count, 4,500, per cubic millimeter of blood.

Despite the low white cell count, the patient was given propylthiouracil, 50 mg. three times a day, because it was necessary to delay operation for several weeks. She was also given ferrous lextron. Three weeks later she felt much improved; she had gained 5 pounds (2.3 Kg.), and the white blood cell count was up to 6,300. On January 9, despite a head cold of two weeks' duration, the basal matabolic rate was down to plus 27 per cent. She had gained 3 pounds (1.3 Kg.). The value for hemoglobin was 87 per cent; the red blood cell count, 4,480,000; and the white blood cell count, 8,300. The propylthiouracil was then stopped, and Lugol's solution, 10 drops three times a day, was ordered.

On January 23 a subtotal thyroidectomy was performed. All three lobes were enlarged, vascular

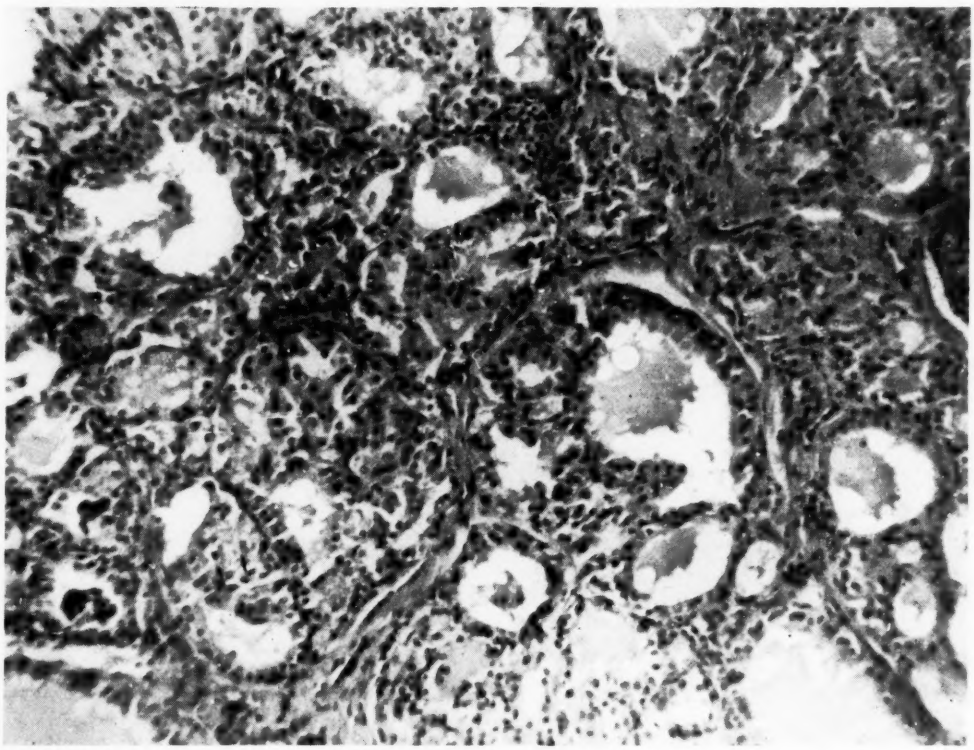

Fig. 3.—Pathologic specimen.

and friable, showing no appreciable effect from the radioactive iodine. The postoperative reaction was moderately severe.

The pathologic report showed that the specimen consisted of two pieces of thyroid tissue of equal size, weighing 13 Gm. One surface of each was partially covered by a thin connective tissue capsule. The opposite surface showed pale pinkish tan, lobulated, thyroid tissue. Cut surfaces were similar except that an occasional focus of yellow calcium was seen. Diagnosis was "thyroid, the seat of focal epithelial and lymphoid hyperplasia, containing two small colloid adenomas."

SUMMARY

Three patients with exophthalmic goiter unsuccessfully treated with radioactive iodine required operation. Their cases are reported.

Treatment had been given to 1 patient four times over a period of nine months and to 2 patients twice in six months.

The question may arise whether further treatment might not have arrested the disease. All patients were becoming progressively worse; all were in a marked stage of hyperthyroidism with an average weight loss of 25 pounds (11.3 Kg.), with an average basal metabolic rate of plus 60 per cent and with progressive exophthalmos.

In the few clinical studies recorded, cases of myxedema and hypothyroidism following the use of radioactive iodine have been reported. No reports have been published concerning patients, similar to those here described, who have failed to respond to radioactive iodine and have undergone thyroidectomy. Further reports are needed so that the actual value of this agent may be determined.

If the published reports, which indicate that 85 per cent of patients with exophthalmic goiter are successfully treated by radioactive iodine, are correct, this agent is definitely another satisfactory method of treating this disease.

The surgical treatment of this condition having reached its present stage of perfection, thyroidectomy undoubtedly will continue to be the method of choice until proved otherwise.

Radioactive iodine has no place in the treatment of adenoma with hyperthyroidism, since only surgical measures will remove the tumor.

Propylthiouracil will prepare patients with severe adenoma with hyperthyroidism for operation, as will Lugol's solution in cases of exophthalmic goiter. Both hyperthyroid states may be reduced to a safe state for thyroidectomy.

RÉSUMÉ

Trois malades souffrant de goître exophthalmique et traités sans succès avec l'iode radioactif, durent être opérés. Leurs cas sont décrits.

Le traitement fut administré à l'un deux, quatre fois, durant une période de neuf mois et à deux autres malades, deux fois en six mois.

L'on se demandera si en continuant ce traitement, l'on n'aurait pas arrêté le cours de la maladie. Mais tous ces malades empiraient progressivement. Ils se trouvaient tous à un stade d'hyperthyroïdisme grave présentant une perte de poids d'environ 11kg, 3, leur taux de métabolisme basal était de plus de 60 pour cent et leur exophthalmie s'aggravait progressivement.

Dans les quelques cas cliniques étudiés, le myxoedème et l'hypothyroïdisme suivit l'emploi de l'iode radioactif. Aucun cas n'a été décrit concernant des malades semblables à ceux que nous mentionnons, qui ne profitèrent pas du traitement et subirent plus tard une thyroïdectomie. Il est essentiel d'obtenir que descas plus nombreux soient signalés de façon à determiner la valeur de cette thérapeutique.

Si les cas publiés, qui indiquent que 85 pour cent des malades atteints de goître exophthalmique, traités avec succès par l'iode radioactif, sont probants, cette thérapeutique est vraiment une méthode satisfaisante pour le traitement de cette maladie.

Le traitement chirurgical de cette affection ayant atteint son perfectionnement actuel, la thyroïdectomie demeurera indubitablement la méthode de choix jusqu'à l'apport de nouvelles preuves techniques.

Le traitement par l'iode radioactif n'est pas indiqué dans les cas d'adénome accompagné d'hyperthyroïdisme, puisqué l'intervention chirurgicale seule est à même d'enlever la tumeur.

Le propylthiouracil aidera les malades atteints, d'adénomes avancés accompagnés d'hyperthyroïdisme à subir l'opération, comme le fera aussi la solution de Lugol dans les cas de goître exophthalmique. Ces deux états d'hyper-

thyroïdisme seront amenés à un stade favorable à la thyroïdectomie.

RESUMEN

Se trataron sin éxito tres pacientes de bocio exoftálmico mediante yodo radioactivo requiriéndose después la intervención, presentándose en esta comunicación dichos casos. Un paciente había sido tratado cuatro veces durante un período de nueve meses, y dos pacientes dos veces en seis meses. Se presenta el problema de si de haber continuado el tratamiento podría haberse detenido el progreso de la enfermedad. Todos los pacientes fueron empeorando progresivamente, hallándose todos en un lamentable estado de hipertiroidismo con una pérdida de peso de 11,3 Kg. con un metabolismo basal medio de + 60% y con exoftalmos progresivo.

En los pocos estudios clínicos registrados se han comunicado casos de mixedema e hipertiroidismo a continuación del empleo del yodo radioactivo. No se han comunicado informes relativos a pacientes que no haya respondido al yodo radioactive o hayan sufrido una tiroidectomía, similares a los casos ya descritos. Se necesitan publicar más casos para poder determinar el valor real de esta sustancia.

Si los casos publicados que indican que el 85 por ciento de los pacientes de bocio exoftálmico se pueden tratar satisfactoriamente por el yodo radioactivo son correctos, este agente puede considerarse definitivamente como otro método satisfactorio para tratar esta enfermedad.

El tratamiento quirúrgico de este proceso ha llegado a tal grado de perfección, que indudablemente la tiroidectomía continuará siendo el método de elección hasta que se demuestre lo contrario.

El yodo radioactivo no tiene papel para tratar el adenoma con hipertiroidismo, ya que solamente las medidas quirúrgicas extriparán el tumor. El propiltiouracilo prepara a los pacientes con adenoma grave con hipertiroidismo para la intervención como lo hará la solución de Lugol, en los casos de bocio exoftálmico. Ambos procesos hipertiroideos pueden mejorarse hasta llegar a un grado que represente la seguridad de mejoría para el paciente tratado mediante la tiroidectomía.

RIASSUNTO

Riporta tre casi di gozzo esoftalmico, nei quali l'operazione si e' imposta dopo una cura inefficace con iodio radioattivo. La cura iodica e' stata somministrata ad un paziente quattro volte in un periodo di 9 mesi: a due paziente due volte in 6 mesi. Tutti i pazienti erano peggiorati, nel senso che erano in uno stato avanzato di ipertiroidismo, con una perdita media di peso di 11,3 Kg., con un ricambio basale medio di 60% e con un progressivo esoftalmo.

Esistono nella letteratura pochi casi, nei quali la cura con iodio radioattivo ha condotto all 'insorgenza di mixedema e di ipotiroidismo. Ma non esistino ancora casi, come quelli descritti dall'A., nei quali la cura e' stata completamente inefficace, rendendo necessaria l'operazione.

Prima di dare ad ogni modo un giudizio definitivo sopra l'efficacia, o meno, della terapia radioattiva occorrono contributi casistici piu' numerosi. Se e' vero che l'85% dei pazienti con gozzo esoftalmico rispondono bene alla cura con iodio radioattivo, possiamo accettare questo metodo di cura come un nuovo sossidio terapeutico. Data la perfezione raggiunta dalla cura chirurgica non esiste pero' alcun dubbio che la tiroidectomia rimane e rimarra' il metodo di elezione fino a che non disporremo di mezzi piu' efficaci.

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Surgical Management of Lesions of the Distal Bowel

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THE surgical management of lesions of the large bowel has assumed an unprecedented plane during the past decade, largely as a result of improvements in anesthesia and advances in the preparation and after-care of patients undergoing formidable procedures.

Carcinoma.—By all odds, the lesion of greatest incidence in this locality is carcinoma, a subject in which we have been chiefly interested. During a period of nine years and four months ending Dec. 31, 1949, our personal records disclose a group of 983 patients with cancer of the large bowel. The distribution by location is appended (Table 1).

TABLE 1.—*Location of Carcinoma*

Site	No. of Cases
Cecum	5
Transverse colon	4
Splenic flexure	3
Descending colon	9
Sigmoid	143
Rectosigmoid	278
Rectum	515
Anal canal	26
Total	983

The type of radical extirpation is shown in Table 2.

The rate of resectability calculated on the number of patients with malignant disease is 79.2 per cent, whereas if computed on the number admitted to the operating room, as suggested by Pemberton, Babcock and Jones, the resectability rate is 87.7 per cent. Since our chief interest has been to evaluate without bias the "pull through" procedure herein referred to as proctosigmoidectomy, patients upon whom this operation was performed have been carefully followed and their charts meticulously studied. It is known that 58.4 per cent are living and well five years after the operation. This includes "favorable cases"—those without glandular invasion or local extension, and "unfavorable cases"—those with glandular invasion and/or local extension, but it excludes those in which there was metastasis to the liver. Although in the last-mentioned group, the patients have not survived the ten-year period, Babcock recently reported a ten-year salvage rate of 47 per cent in his series. The incidence of local recurrence in our cases is 17.9 per cent, which compares favorably with that recorded by others.

Multiple Polyposis.—This disease entity parades under a variety of names, and, although rare, is encountered with greater frequency as a result of routine sigmoidoscopic examination and improvement in double-contrast roentgenologic technic. Our experience is limited to 18 patients (Table 3).

Of the 18 patients, 2 refused operation; ileostomy was established in 1, who did not return for colectomy. In the remaining 15 patients total or partial resection was performed without fatality.

Adenomatous Polyps.—Quite separate and

TABLE 2.—*Type of Radical Extirpation*

	No. of Cases	*Deaths*	*Mortality, %*
Resection (right, transverse, left colon)	17	2	11.7
Sigmoidectomy	106	9	8.4
Abdominoperineal proctosigmoidectomy without colostomy, with preservation of anal sphincters	469	23	4.9
Abdominoperineal excision	177	6	3.3
Hemicolectomy with proctosigmoidectomy	9	1	11.1
Total	778	40	5.1

distinct from the entity previously referred to is the solitary adenoma, or polypoid process, commonly encountered in the colon and rectum. Since the potential of malignant degeneration is exceedingly high, early destruction always is to be recommended. Lesions of

TABLE 3.—*Multiple Polyposis*

No. of Patients	*Age*	*Sex*	*Incidence of malignancy*	
1	8	F	0	
2	15	F	+	
3	24	M	0	
4	24	M	0	
5	28	M	+	
6	29	M	+	
7	29	M	+	
8	29	M	0	66.6%
9	31	M	0	malignant
10	32	M	+	
11	42	F	+	
12	56	M	+	
13	47	F	0	
14	24	M	+	
15	44	M	+	
16	60	M	+	
17	58	M	+	
18	60	F	+	

known benignity, as disclosed by microscopic examination, located below the peritoneal reflection are destroyed by fulguration or removed by the electric snare. We are absolutely opposed to the recommendations of Buie and a few others that early or small lesions known to be malignant and situated on the posterior wall may be similarly eradicated. A malignant lesion demands radical surgical removal not only of the tumor itself but of contiguous structures and node-bearing areas as well.

Adenomatous polyps above the peritoneal reflection are removed by an abdominal approach through the bowel wall. When the stalk of the polyp measures 2.5 cm. or more, and frozen section confirms its benignity, the process is removed and the bowel wall closed in the classic fashion, with drainage. When

TABLE 4.—*Transcolonic Removal of Polyps*

Author	*No. of Cases*	*Mortality, %*	*Malignancy, %*
Mayo & Smith	62	3.2	62.9
Cattell & Swinton	41	2.4	24.3
David	20	0	?
Bacon & Sauer	65	3.0	50.7

the stalk measures less than 2.5 cm. and its base is broad, resection with immediate end-to-end anastomosis is performed. Our experience with transcolonic removal of adenomatous polyps is shown in Table 4. Attention is called to the incidence of malignancy as disclosed by serial section.

Hemicolectomy and Proctosigmoidectomy with Transplantation of the Transverse Colon to the Anus and Preservation of the Anal Sphincter Musculature.—Although limited in its applicability, this procedure has been employed in a small group of patients with extremely satisfactory results, both immediate and remote.

Chronic Ulcerative Colitis.—Though this disease in approximately one-third of all cases can be cured by means of a rigid medical regimen according to Streicher, such authorities as Kiefer and Jordan conclude that the medical treatment of chronic ulcerative colitis must be regarded as a control and not a cure. They further state that the only cure now available is complete colectomy. With this we are in hearty accord. It should be emphasized that the mortality following medical treatment is greater than that following resection.

In a personal series of 248 cases of chronic ulcerative colitis, ileostomy was instituted in 27 instances, with 4 deaths, a mortality of 14.7 per cent. Colectomy, either partial or total, was performed in 22 cases without a fatality. In each instance the rectum was removed. It should be mentioned that over 90 per cent of colectomized patients are rehabilitated.

Inflammatory Rectal Strictures.—Our experience with lymphogranuloma venereum as related to inflammatory rectal strictures is based on a series of 718 patients with organic narrowing of the bowel. For nearly a decade various chemical, biologic and physical agents were employed, with but little success. Palliative surgical procedures likewise offered only temporary respite. Resection or excision proved to be the procedure par excellence. In the presence of anal esthiomene, multiple abscesses and fistulas the anal sphincters must be sacrificed; therefore colostomy and later posterior excision is recommended. Otherwise, proctosigmoidectomy without permanent colostomy and with preservation of the sphincters is instituted. We have had no mortality

TABLE 5.—*Transplantation of Transverse Colon to Anus*

Patient	*Race*	*Sex*	*Age*	*Diagnosis*	*Deaths*
1. C.B.	W	M	32	Polyposis with malignancy	0
2. E.A.	W	F	42	Polyposis with malignancy	0
3. W.J.	W	M	35	Adenocarcinoma	0
4. G.W.	W	M	63	Diverticulitis with stricture	0
5. S.M.	W	M	28	Carcinoma	0
6. B.S.	C	F	46	Inflammatory stricture of colon and rectum	0
7. M.L.	W	F	32	Ulcerative colitis and malignancy	0
8. M.B.	C	F	57	Malignancy	0
9. M.K.	W	M	62	Malignancy	0
10. R.S.	C	F	38	Inflammatory stricture from low rectum to splenic flexture	0
11. J.K.	W	M	65	Polyposis with malignancy	0
12. G.McC	W	M	50	Malignancy and diverticulitis	1
13. E.R.	W	M	50	Malignancy	1

TABLE 6.—*Left Hemicolectomy and Proctosigmoidectomy*

Number of cases	13
Mortality	7.6%
Postoperative period of hospitalization	14.2 days (average)
Return to work	2½ months (average)

from the latter type of resection, but the morbidity has been marked, for which reason a transversotomy is performed initially as a temporary procedure.

scess, perforation, fistula and obstruction. More than occasionally it is impossible to distinguish between malignant disease and diverticulitis, for which reason exploration under such circumstances is justifiable. In our opinion, removal of the diseased segment of bowel is indicated in the presence of recurring symptoms and in cases in which a fistula exists after complete proximal defunctionalization; also in cases in which malignant change is indeterminate. In our group of 115 patients

TABLE 7.—*Surgical Treatment of Chronic Ulcerative Colitis*

Author	*Ileostomy*	*Mortality, %*	*Colectomy*	*Mortality, %*
Cave	65	18	55	10.9
Cattell	145	18	121	20.8
Garlock	38	15.7	46	10.8
Bargen & Pemberton	130	26.9	30	36.3
McKittrick	54	27.7	10	10
Rankin	26	31.7	—	—
Lemmer	17	23.5	11	18
Ferguson	14	—	9	—
Best	8	12.5	1	—
Ault	6	16.6	13	15.3
Rhoads	36	5.5	24	10.5
Wangensteen	—	—	13	0
Bacon & Sauer	27	14.7	22	0

Diverticulitis.—There is common agreement that a good proportion of patients suffering with diverticulitis will respond to nonsurgical therapy. Too, there is little difference of opinion that the complications of this disease require surgical intervention. Among these may be mentioned peridiverticular abscess, perforation, fistula and obstruction. More than occasionally it is impossible to distinguish between malignant disease and diverticulitis, for which reason exploration under such circumstances is justifiable. In our opinion, removal of the diseased segment of bowel is indicated in the presence of recurring symptoms and in cases in which a fistula exists after complete proximal defunctionalization; also in cases in which malignant change is indeterminate. In our group of 115 patients with diverticulitis, 39 were subjected to operation as shown in Tables 9 and 10.

Endometrioma.—There were 4 cases of endometrioma of the rectosigmoid. All were diagnosed after operation. Proctosigmoidectomy with preservation of the sphincters was performed in 3 instances. The other patient

TABLE 8.—*Mortality Rates*

	No. of Cases	*Mortality, %*
Abdominoperineal excision (Miles)	8	0
Colostomy and perineal excision	51	1.9%
Abdominoperineal proctosigmoidectomy	28	0
Hemicolectomy and proctosigmoidectomy	3	0
	90	1.1

was treated by resection with end-to-end anastomosis, also with a successful result.

RÉSUMÉ

Les auteurs présentent leurs séries de cas de cancer du gros intestin, de polypose multiple, de polypes, de colites chroniques ulcératives, de formations inflammatoires, de diverticules et d'endométriômes. Le taux de mortalité et de morbidité est moins élevé et le pourcentage de survie pour les malades atteints de carcinome peut être comparé à celui d'autres statistiques.

La transplantation du gros intestin transverse au périnée est décrit pour souligner l'aise avec laquelle on peut résoudre par là quelques problèmes des plus difficiles, tels que la polypose, la diverticulite propagée à une importante partie de l'intestin et, (pour quelques cas), la colite ulcérative segmentaire.

RESUMEN

El autor presenta una serie de casos de cáncer del intestino grueso, poliposis múltiple, pólipos, colitis ulcerosa crónica; procesos inflamatorios, estenosis inflamatoria, diverticulitis y endometrioma. El porcentaje de mortalidad y morbilidad decreció y el porcentaje de supervivencia en los pacientes con carcinoma puede compararse a los observados en otras estadísticas. Se examina la transplantación del colon transverso al perineo por su conveniencia para solucionar algunos problemas dificiles, tales como poliposis, diverticulitis extensa y, en algunos casos, colitis ulcerosa segmentaria.

RIASSUNTO

Presentano una vasta statistica personale di carcinomi del colon, di poliposi, di polipi, di coliti ulcerative croniche, di diverticoli e di endometriomi. La mortalita' e la morbilita' sono diminuite; la percentuale di sopravvivenza dei carcinomi viene confrontata con altre statistiche.

Discutono le indicazioni di un trapianto del

TABLE 9.—*Various Operations for Diverticulitis*

Operation	*No. of Cases*	*Deaths*	*Mortality, %*
Colostomy for obstruction	5	1	20
Incision & drainage abscess	3	1	33.3%
Drainage for perforation without closure	2	0	0
Exploration only	2	0	0
	12	2	16.6

TABLE 10.—*Resection for Diverticulitis*

Type of resection	*No. of Cases*	*Deaths*	*Mortality, %*
Exteriorization	6	0	0
Abdominoperineal proctosigmoidectomy	4	0	0
Abdominoperineal proctosigmoidectomy with hemicolectomy	1	0	0
Primary end to end anastomosis	10	1	10
Anterior resection (excision) with colostomy and exteriorization of closed rectal stump partial cystectomy in four	6	0	0
	27	1	3.7

colon trasverso nel perineo in taluni casi complicati o difficili: come nelle poliposi, nelle diverticoliti molto estese e (in taluni casi) nelle coliti ulcerative segmentarie.

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European Medical Schools Accepted By A. M. A.

The high standards of the schools listed below have been recognized by the American Medical Association, and their graduates are placed on the same basis as those of approved medical schools in the United States. As information becomes available, other universities will be added.

Denmark—University of Copenhagen

Finland—University of Helsinki; Turku University

Netherlands—University of Amsterdam; Royal University of Groningen; Royal University of Leiden; Royal University of Utrecht

Norway—University of Oslo

Sweden—Royal Charles University, Lund; Charles Medico-Surgical Institute, Stockholm; Royal University of Uppsala

United Kingdom—Universities of Aberdeen, Birmingham, Bristol, Cambridge, Durham, Edinburgh, Glasgow, Leeds, Liverpool, London, Manchester, Oxford, St. Andrews, Sheffield, and Wales; Queen's University, Belfast

The Broadened Scope of Otolaryngology

FRANCIS L. LEDERER, M.D., F.A.C.S.

CHICAGO

HISTORIANS have related for us the progress of medicine and surgery since the dawn of man. Their researches make interesting reading. Out of the maze of such literature as pertains to the development of the art of surgery emerges the story of a struggle for recognition and survival. In the early thirteen hundreds, there already was a distinction drawn between "men of the long robe" (the surgeons) and "men of the short robe" (the barbers). The centuries that followed this turbulent epoch witnessed many changes characterized by clashes against disease, personal and political differences, bigotry, quacks and charlatans, and man's own environmental transcendency.

"It is a curious fact," stated Clendening,[1] "that the subjects that we now call specialties —diseases of the eye, ear, nose and throat— were very late in developing, and until 1800, were almost literally relegated by the medical profession to the quacks. The plight of a patient with an eye or ear disease up to the end of the eighteenth century, was pitiable in the extreme." A hundred years ago, otolaryngology represented a peculiar branch of medicine. It is said that when Abernethy was asked to serve as honorary president of the London Eye and Ear Infirmary, he replied, "I can see no good that can arise from this to the public; it may be of use to the surgeons, but I candidly tell you I consider it quackery; I will never lend my name to sanction it; every surgeon should be acquainted with the diseases of the organs of sight and hearing; and to detach them from regular surgery would be not less injurious to the science than oppressive to the public."

Through the years, many another effort has been made to show the evils of specialization. Isaac Harvey Flack,[2] writing under the pseudonym of Harvey Graham, remarked that in one sense Abernethy was right: "Specialization has inevitable disadvantages, but the many specialties into which surgery has been divided would not be surviving and indeed flourishing today, if they had not justified themselves by their accomplishments. The great empires of more than a thousand years ago saw their surgery decay not because their surgeons specialized, but because their surgeons achieved nothing." Clendening likewise observed: "Specialization may not be a more desirable thing, but it is an undoubted fact that the cooperation of specialists in innumerable overlapping departments has effected changes in the structure of medicine and surgery greater and more lasting than any previously known."

A more pointed statement was recently made by Wangensteen,[3] who said: "There are still a few surgeons who affect to believe that they can take all of surgery for their province. They know as anyone that their performance in such a wide category of operative procedure is substandard in some of these areas, when judged in the critical light of what constitutes good practice. Let us be thankful that the day of the all-around surgical specialist is done! Surgery is not advanced by that type of activity. . . . No matter how talented the surgeon, he cannot do equally good work in all these provinces."

Otolaryngology as a specialty had its beginning in the field of thoracic disease, the upper portion of the respiratory tract being considered inseparable from the lower. The preceptor system served as the background for workers in this field, and the training was comprehensive, with practice under supervision. Undergraduate teaching in the specialty was not given its deserved place, nor were a sufficient number of hours allotted to it in the curriculum. (Even today, many schools of medicine fail to give undergraduates the opportunity to become conversant in the field or the knowledge that is necessary to conduct a complete examination of the ear, nose, throat and larynx. In our undergraduate

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teaching we include only such basic knowledge as enables the student to integrate otolaryngology with medicine as a whole and later, as a practitioner, to recognize situations that require expert assistance.) Well organized postgraduate facilities in the United States were lacking. Those who were interested in the specialty sought opportunities for study abroad, where well rounded curriculums did not exist and where the choice of subjects and instructors were left entirely to the student.

Specialization by convenience or self-appointment is no longer considered justified, nor is it condoned. Granted that education of the physician must be a continuing process throughout his life, self-education is not always the most expedient or reliable approach. Progress has resulted from the demands of specialty boards that candidates be motivated and adequately trained in the arts of medicine and surgery. The acquisition of correct surgical technics must be predicated upon a basic knowledge of anatomy, physiology, biochemistry, bacteriology and pathology, especially of the organs and physical structures concerned with the field in which the physician seeks recognition. To meet these standards, rigid courses of study have been set up, to be followed by carefully planned resident training programs.

Otolaryngology has kept faith and pace with the general advances of medicine and surgery. It has profited from contributions to the knowledge gained in other fields of endeavor, but it has also made its own share of contributions to the fundamental concepts of disease and to the advancement of surgical technic.

Like most other new developments, the specialty of otolaryngology was at first not too thoroughly appreciated. The etiologic, physiologic and pathologic aspects were as vague and limited as the therapy was inadequate. As long as the field was restricted to a few mechanical procedures, it remained barren of real progress and advancement. Enrichment and progress were made possible by the leadership of men whose vision created separate and autonomous departments in universities and organized the second examining board (1924) to determine, and thus stimulate, a higher level of training for specialization and medical practice. The resulting disciplines led to recognition rather than neglect of the fact that the organs or parts of the head and neck are not anatomically, physiologically or pathologically independent organs, but are integral parts of the human physical economy. As Alan Gregg[4] aptly stated, "I should like it to be a cardinal axiom of medicine that an organism is so intimate a relationship of constituent parts that you cannot modify any one of them without affecting all the others; and that, therefore, a given result comes usually not from one cause but from a combination of causes, sometimes a sequence, sometimes a constellation or pattern; and similarly that a given cause has not merely one but many results, sometimes in sequence, sometimes in a pattern." In other words, the basic concept of the "total person" predicates the rational approach to medical or surgical management.

We might inquire of ourselves, "Is otolaryngology a narrowed or a restricted specialty, and what gave rise to it in its present form?" It embraces the fundamental aspects of disease of the ear, nose and throat, surgery of the neck, reconstructive surgery, bronchoesophagology, allergy, physical medicine and audiology. In all specialities there is some overlapping at the borderline, and each specialty tries to claim for its own the duties and functions rightly belonging to others. For example, the inguinal hernia has been said to belong in the domain of the plastic and reconstructive surgeon; yet this operation is performed by general surgeons. Nerve suturing in the extremity would seem to call for a neurosurgeon, but it is performed by orthopedic and plastic surgeons as well. Fracture of the face and jaws would seem by definition to lie within the realm of plastic surgery, but it is also within the scope of the oral surgeon. Such examples may be observed in all branches of surgery; we all have witnessed advancements and new technics that make it possible for one specialty to take over the new development and become proficient in the field. A striking example is to be found in thoracic surgery, whose experts were taught the use of the bronchoscope by men in our field.

The specialty of otolaryngology is no more static than any other specialty. Becoming ex-

tremely proficient in the knowledge and art of an area of the body of which one already has an intimate understanding, one merely adds to the technics that may be applied to the head and neck. The field for expansion is unlimited. It is not my belief that one must first become a general surgeon, later taking up the specialty as an afterthought or sideline, so to speak; however, a knowledge of general surgery is a *must* and has tremendous value in preparation for any surgical specialty. As has been stated, no man can do more than master one specialty in a lifetime. Mastery of the entire field of surgery is a goal too difficult for any one to attain.

To put it concretely and succinctly, the otolaryngologist is at loggerheads with the general surgeon who would limit him to the arbitrarily determined anatomic spaces of the head or neck, without himself having a basis, by virtue of his own preparation, training and experience, to assume unrestricted qualification for surgical intervention in the adjoining areas. Can the general surgeon's basic preparation in the study of the head and neck match that of the otolaryngologist? If so, let him proceed; but if not, let him qualify himself, for that is what we expect of those who come under our direction.

Arguments as to "who does what, with which and to whom" must not take personalities into consideration, but must present a problem with a solution. An economic situation must be recognized and brought to the surface without regard for individual feelings or even for propriety. Just as the medical practitioner objects to the position of the general surgeon, who receives what he considers to be a disproportionate financial remuneration, the general surgeon objects to the position of the surgical specialist. What he resents in his medical colleagues he actually practices in relation to his colleagues in the surgical specialties. The remedy for this paradoxical situation is suggested in the adage, "Surgeon, cure thyself." Science changes, but ethical precepts and moral codes require no revision or repair.

Training of the specialist based solely on the conventional residency will always fall short of its goal. At the University of Illinois we have tried both plans and have found that a carefully conducted basic course, prerequisite to residency, is of greater value both to the specialist in training and to the service of the hospital. Careful study of hospitals accepted for resident training will prove conclusively that the majority are not in a position to give adequately planned training without the prerequisite of a basic course in otolaryngology. The in-service type of training during a busy residency period is too much of a hit-or-miss proposition. Generally speaking, it benefits only the physician, who, on his own, can eventually complete a prescribed course of study, but even for him it is not a desirable approach. Gallie[5] recently propounded this question: "How many hospitals do you know where a three-year assistant residency is offered, or where regular ward rounds or conferences are held, or where supervised courses of study are provided in anatomy, applied physiology, and applied pathological chemistry? And how many hospitals do you know where interns are encouraged to make use of the libraries or to take part in surgical research? The answer is, very few. There are, of course, outstanding examples to the contrary, where the training of the intern is a major interest of the staff, but when one adds up the number of these hospitals and makes up the grand total of graduates receiving such training, it will be found that the number is very small."

It might be well to examine the curricular requirements of the basic course in otolaryngology at the University of Illinois, which is designed to stimulate the initiative, aptitudes, interests and talents of those desirous of taking up the specialty. (In another publication, we have given the details of this project.[6]) The selection of subject matter and the hours assigned (approximately 1,800) indicate the scope and intensity of study in complete preparation for the specialty of otolaryngology:

	Hours
1. Anatomy of the Head, Neck and Thorax	
Dissection	240
Gross and Microscopic Anatomy	80
Surgical Anatomy	60
2. Embryology of the Head and Neck	24
3. Histology and Pathology—General, Special	200
4. Physiology	30

5.	Bacteriology	72
6.	Pharmacology	72
7.	Anesthesia	10
8.	Allergy	36
9.	Neurosurgery	10
10.	Dermatology	10
11.	Plastic and Maxillofacial Surgery	100
12.	Bronchoesophagology	100
13.	Didactic Otorhinolaryngology	160
14.	Surgical Procedures	130
15.	Laboratory Technics	12
16.	Clinical Seminars	100
17.	Pediatric Aspects	6
18.	Stomatology	16
19.	Bloods and Its Disturbances	6
20.	Psychosomatic Aspects	6
21.	Otolaryngological Forum	30
22.	Aviation Medicine	4
23.	Tuberculosis	6
24.	Surgical Clinics	30
25.	Prosthetics	8
26.	Special Problems	100
27.	Medicolegal Problems	6
28.	Clinic Routine	30
29.	Speech and Hearing Disorders	60
30.	Miscellaneous Subjects	100

This course is designed to attract the highest caliber of medical graduate, for whom an additional four to five years of serious study in preparation for the specialty assumes meaningful proportions. He has already completed a rotating internship in an approved hospital, with at least six months of general medicine and six months or more of general surgery and pathology. At the completion of the basic course he enters an approved residency.

We insist that continued supervision of this part of the two- to five-year period be arranged with a definite curriculum in mind. It may be of interest to examine the resident training program in the Chicago area, because it clearly exemplifies the entire situation. A truly basic course should be thought of as such and the practical training left for the residency period. The importance of teaching the resident the general principles of modern medicine and surgery is a foregone conclusion. This is fundamental because of the dependence of one part of the body on another. Without a broad background of training in the whole field of medicine, the specialist could not be so designated. Any tendency on the part of the specialist to lose the broad grasp of medicine as a whole, and to look for the cause of ill health solely in his own narrow field, is to be deplored. He must possess the ability of "listening with the third ear" (Reik[7]), the intuitive sensibility and empathy that are among the necessary talents of a good physician. The resident must first of all be taught to be a good doctor. He must have the ability to contend with and recognize underlying diseases and to handle emergencies. This presupposes a knowledge of the basic sciences. Without this advantage, he would fall short as a specialist, in the identification and treatment of disease.

In Chicago, we have attempted to pool all available resources in the interest of an effective three- to five-year residency training program. The purpose is to provide adequate training of residents in otolaryngology through the joint and reciprocal efforts of interested hospitals and medical schools in Chicago. In the past, each institution and school has concentrated on its own educational program. The combined resources, facilities and staffs produce an integrated effort of far greater value.

Approximately 35 men are being trained in residencies in otolaryngology in the various hospitals of Chicago. Each institution's educational scope is limited in some respect. Utilizing the facilities and advantages of all organizations through a regulated teaching program and a rotating exchange service gives each resident the opportunity to obtain not only a broader type of training but a great many more varied professional contacts. Such a plan makes up for any deficiencies in the training program of any single institution.

Each resident is required to have had at least one year of basic training in a recognized postgraduate course of otolaryngology. Each hospital selects its own residents and has complete control of their training within its walls. It is required of the resident, with the cooperation of the staff, that he attend all organized and scheduled courses of instruction wherever and whenever these are given. A monthly schedule is issued and sent to the Head of the Department of Otolaryngology in each organization, so that the necessary arrangements may be made in advance. For hospitals having more than one resident, ar-

rangements are made for each resident to obtain the full course of instruction without the necessity for both participating at the same time. Appropriate programs for resident training are outlined and carried out by each institution. This includes supervised clinic work and operative work (both private and charity). Where facilities are available, cadaver dissection and dog surgery are given. Adequate reference literature is available, and the residents are given guidance in clinical and investigative research.

This program is also designed to enable the residents to attend a scheduled course of instruction held at the various affiliated institutions. Each attends the regular meetings of the Chicago Laryngological and Otological Society and reading club groups held at his hospital. Each participating institution is required to give a series of lectures or clinical demonstrations at specified times to the entire group of otolaryngologic residents at the Chicago Hospital Group. These sessions are held in the evening, not to exceed one month for each institution, and programs are published in advance in the monthly bulletin. Attendance is obligatory for all residents.

Whenever practicable, each resident has the opportunity of serving several monthly periods in other institutions, such as the Illinois Eye and Ear Infirmary, the Municipal Tuberculosis Sanitarium, and Cook County Hospital. This rotation service is optional. During the resident's absence, a resident from one of the affiliated hospitals substitutes for him. Adequate quarters and maintenance are furnished the substitute resident. Not more than three months of each residency period are taken up by this rotation service.

For those residents who are preparing for otolaryngology as a head and neck specialty, we have provided a five-year plan. This period is made up of one year's basic study of otolaryngology, two years of general surgical residency (with emphasis on surgery of the head and neck), one year of a general otolaryngologic residency and a fifth year as resident on the head and neck specialty service.

The respects in which a broadened concept of otolaryngology goes beyond the fundamental aspects of diseases of the ear, nose and throat have already been mentioned. With regard to surgery of the neck, it is our opinion that the otolaryngologist should be versed in this type of surgery, not only because this area is often neglected but because he comes by it naturally as the result of his superior basic training in cervical anatomy. The anatomy and physiology have been approached locally, mainly from the standpoint of thyroid surgery; apart from this, only a few general surgeons have interested themselves in this anatomic region. The few who have qualified in it have been skilled surgeons, but they are the exception rather than the rule. We need surgeons who are acquainted with the neck, not just surgeons who occasionally operate on it. We need surgeons with prerequisite training and skill to become masters of every critical situation. Since the majority of metastasizing tumors in the neck have their primary origin in the areas of which the otolaryngologist has special knowledge, it is a logical step for him to assume responsibility for areas of secondary extension. His long identification with the formidable procedure of laryngectomy is certainly sufficient proof of his proficiency.

In the field of reconstructive and reparative surgery, there is great opportunity for the well trained otolaryngologist. Rhinoplastic surgery is but a small part of the field. Burns of the face and neck, traumatic wounds, and congenital defects and deformities present a challenging group of conditions especially designed for the otolaryngologist with an adequate background.

The training of the otolaryngologist in bronchoesophagology places him in a preeminent position to deal with structures surrounding and related to the larynx, the trachea and the upper part of the esophagus. Pharyngeal diverticulum is an excellent example of the combined endoscopic and external surgical procedures made possible by this knowledge. Reparative external laryngeal procedures for the establishment of an airway after bilateral abductor paralysis of the larynx is another example of the combined approach for which the otolaryngologist had adequate training and experience. The diagnosis and management of bronchopulmonary disease have been greatly enhanced by bronchoscopic study. Whereas in former years the broncho-

scopic approach was mainly associated with foreign bodies, the modern management of tumors of the bronchi (malignant as well as benign), pulmonary abscess, bronchial asthma, postoperative pulmonary atelectasis and tuberculous tracheobronchitis has been aided immeasurably by bronchologic advances.[8]

The belief expressed by the uninformed, that otolaryngology is rapidly becoming a restricted specialty, is refuted by the fact that the present-day specialist is required to know more than did the specialist of the pioneering period.[9] Actually, the modern trained specialist is better qualified to acquire this increased knowledge. He is better grounded in the basic sciences. His training includes basic instruction prior to hospital or resident training. He actually performs operations under careful supervision, in contrast to the older method of observation only, by which students used, as Cheever[10] so aptly stated, "to attach themselves to a chief and absorb, as it were by osmosis, some of the essence of his work." The proper approach to the problem was well expressed by Gallie,[5] who said: "The truth is that in modern first class teaching hospitals, the diagnosis should be made, the type of treatment selected and operation performed by the resident staff under the constant guidance and supervision of their teachers. The attending staff should reserve for itself only special groups of cases which obviously require more experience and skill than the assistant residents have so far acquired." In doing the various procedures expected of thoroughly trained otolaryngologists, the resident will encounter the pitfalls that only long and arduous experience might otherwise offer him. In personally following through medical and surgical procedures, he gains the necessary confidence to carry on in the future as a head and neck specialist. As Pasteur so appropriately said, "In the fields of observation, chance favors only the mind which is prepared."

SUMMARY

1. Modern otolaryngology is a specialty that has gradually but surely progressed from a primitive beginning to standards of high scientific attainment.

2. The scope of the specialty was broadened and will continue to broaden as medicine and surgery continue to make the rapid strides they have made in the past half century.

3. Modern otolaryngology, with its broadened scope, has no time for "piddlers." Those who contemplate entering the field must have a broad education; they must be prepared to equip themselves by long training and experience to serve mankind in accordance with modern concepts of medicine and surgery.

RÉSUMÉ

1. L'otorhinolaryngologie moderne est une spécialité qui a progressée graduellement mais sûrement, ayant acquis, après des débuts très simples, une valeur scientifique particulièrement élevée.

2. L'horizon de la spécialité s'est élargi et il continuera à s'amplifier tout autant que la médecine et la chirurgie continueront à avancer à grands pas ainsi qu'ils ont fait au cours de la dernière moitié du siècle dernier.

3. L'otorhinolargyngologie moderne avec ces horizons élargis n'est pas pour les amateurs. Ceux qui ont l'intention d'entreprendre cette carrière doivent avoir un bagage scientifique sérieux; ils doivent se préparer par de longues études et par la pratique pour pouvoir rendre service à l'humanité selon la conception moderne de la médecine et de la chirurgie.

RESUMEN

1. La Otorinolaringología moderna es una especialidad que de un modo lento, pero ininterrumpido, ha progresado desde sus comienzos primitivos, hasta alcanzar un nivel de gran altura científica.

2. El horizonte de esta especialidad se ha ensanchado y sigue haciéndolo aún, a medida que la Medicina y la Cirugía continúan avanzando del modo rápido como lo han hecho en los últimos cincuenta años.

3. La Otorrinolaringología moderna, al haber ampliado su campo no tiene cabida para los que simplemente se asoman a "curiosear". Aquellos que piensan entrar en este campo, deben tener una amplia base cultural y estar preparados para educarse a sí mismos mediante un largo período de adiestramiento y

experiencia con el objeto de poder servir a la humanidad utilizando las conquistas modernas de la Medicina y la Cirugía.

RIASSUNTO

1) L'otoraringologia moderna e' una specialita' che ha continuamente progredito, in modo da raggiungere un alto livello scentifico.

2) Gli scopi e le mete della specialita' si sono notevolmente ampliate in rapporto ai rapidi progressi della medicina e della chirurgia negli ultimi decenni.

3) Questa specialitá non si presta agli indolenti. Coloro che la prescelgono, debbono avere una profonda cultura: debbono essere preparati ad una lunga e faticosa esperienza onde servire l'umanita' in base ai postulati della medicina moderna.

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Forthcoming Assemblies

The Annual Assembly of the Indian Chapter, International College of Surgeons, will be held in Bombay on September 28, 29 and 30, under the leadership of Mr. R. N. Cooper, President, and Dr. V. P. Mehta, Secretary. All members of the College are cordially invited to attend. Details of the meeting may be obtained by writing to Dr. V. P. Mehta, 114, Church Gate, Reclamation, Bombay 1, India, or to the International Secretary General, 1516 Lake Shore Drive, Chicago 10, Illinois.

The International Anatomical Congress will be held at Oxford, England, July 25-28. The program includes general anatomy, histology, embryology, morphogenics, endocrinology, neurology and physical anthropology. Headquarters of the congress is at the Department of Human Anatomy, University Museum, Oxford, and is in charge of Professor W. E. Le Gros Clark, F. R. S.

The Second Argentine Congress of Radiology will be held in Tucuman, Argentina, from May 27 through the 31st, under the auspices of the Argentine Association of Radiology. A cordial invitation is extended to all who are interested. Those desiring to attend the meeting may contact Dr. Lidio G. Mosca, President of the Second Argentine Congress of Radiology, Avenida Gral Paz, 151, Cordoba, Argentina.

Recent Trends in Esophageal Surgery

PHILIP THOREK, M.D., F.A.C.S., F.I.C.S.
Associate Secretary, International College of Surgeons
CHICAGO

IN THE past decade surgery of the esophagus has made tremendous strides, not only in the field of carcinoma but also in the numerous other conditions which this organ is heir to. Diseases of the esophagus fall not only into the realm of the surgeon but into that of the general practitioner, the internist, the pediatrician, the anesthetist, the roentgenologist and the otorhinolaryngolist as well. It is for this reason that a presentation dealing with this subject is timely.

ANATOMIC CONSIDERATIONS

Some points in the surgical anatomy of the esophagus bear emphasis (Fig. 1). It is well to remember that the esophagus per se is 10 inches (25 cm.) in length, extending from the sixth cervical vertebra (cricoid cartilage level) to the tenth dorsal vertebra (esophageal hiatus level). The esophagologist, however, does not measure from the sixth cervical vertebra but rather from the alveolar margin, which adds an additional 6 inches (15 cm.) to its actual length; thus he bases his report upon a 16-inch (40-cm.) structure.

The esophagus has three normal curves and three physiologic constrictions. Its three curves or flexures are placed in the following manner: in the neck it curves to the left, as it descends in the thorax it curves to the right, and as it approaches the esophageal hiatus it curves again to the left. These flexures are of practical importance, since they may determine the proper side of approach. The three physiologic constrictions are located (1) at the level of the cricoid cartilage (sixth cervical level), (2) at the arch of the aorta and (3) at the esophageal hiatus. It is at these constrictions that the greatest amount of irritation takes place and the greater number of pathologic lesions are observed. Most foreign bodies are impeded in their path downward at the first physiologic constriction and are therefore found on a level with the sixth cervical vertebra. In locating a swallowed foreign body it is all-important, therefore, to order not only a roentgenogram of the chest but one of the neck as well.

The relation of the vagus nerves to the esophagus should be stressed, since these nerves may be involved or must be sacrificed in some esophageal procedures. Although much has been written recently regarding the anatomy of the vagi and although numerous patterns have been described, in the main it may be stated that the left vagus nerve passes along the anterior aspect of the esophagus, intimately hugs the food pipe and is the smaller of the two vagi. The right vagus passes posteriorly, does not hug the esophagus and is larger.

To know the boundaries of the so-called "esophageal triangle" is to make identification and isolation of the supradiaphragmatic portion of the esophagus a simple and rapid maneuver. This anatomic triangle is bounded in front by the heart, behind by the descending aorta and below by the diaphragm.

Almost every text, monograph or recent article calls attention to the poor blood supply of the esophagus. I cannot agree with this teaching. To emphasize this point one needs only to divide the esophagus into upper (cervical), middle (thoracic) and lower (abdominal) parts. The upper part of the organ is supplied voluminously by the inferior thyroid artery; the middle or thoracic part is supplied by aortic, bronchial and intercostal branches; the lower part is well supplied by the left gastric and the inferior phrenic arteries. In my work I have demonstrated, and also presented in a recent motion picture of the actual procedure, the removal of the entire thoracic esophagus, both supra-aortic and infra-aortic portions, from its mediastinal bed. After this the esophagus was transected at its entrance into the stomach, and brisk, bright red arterial oozing was noted. I feel, therefore, that much more can be expected of the esophagus in its

Read at the Fourteenth Annual Assembly of the United States Chapter, International College of Surgeons, Atlantic City, November 8, 1949.

From the Departments of Surgery, University of Illinois, Cook County Graduate School of Medicine, Cook County Hospital and American Hospital.

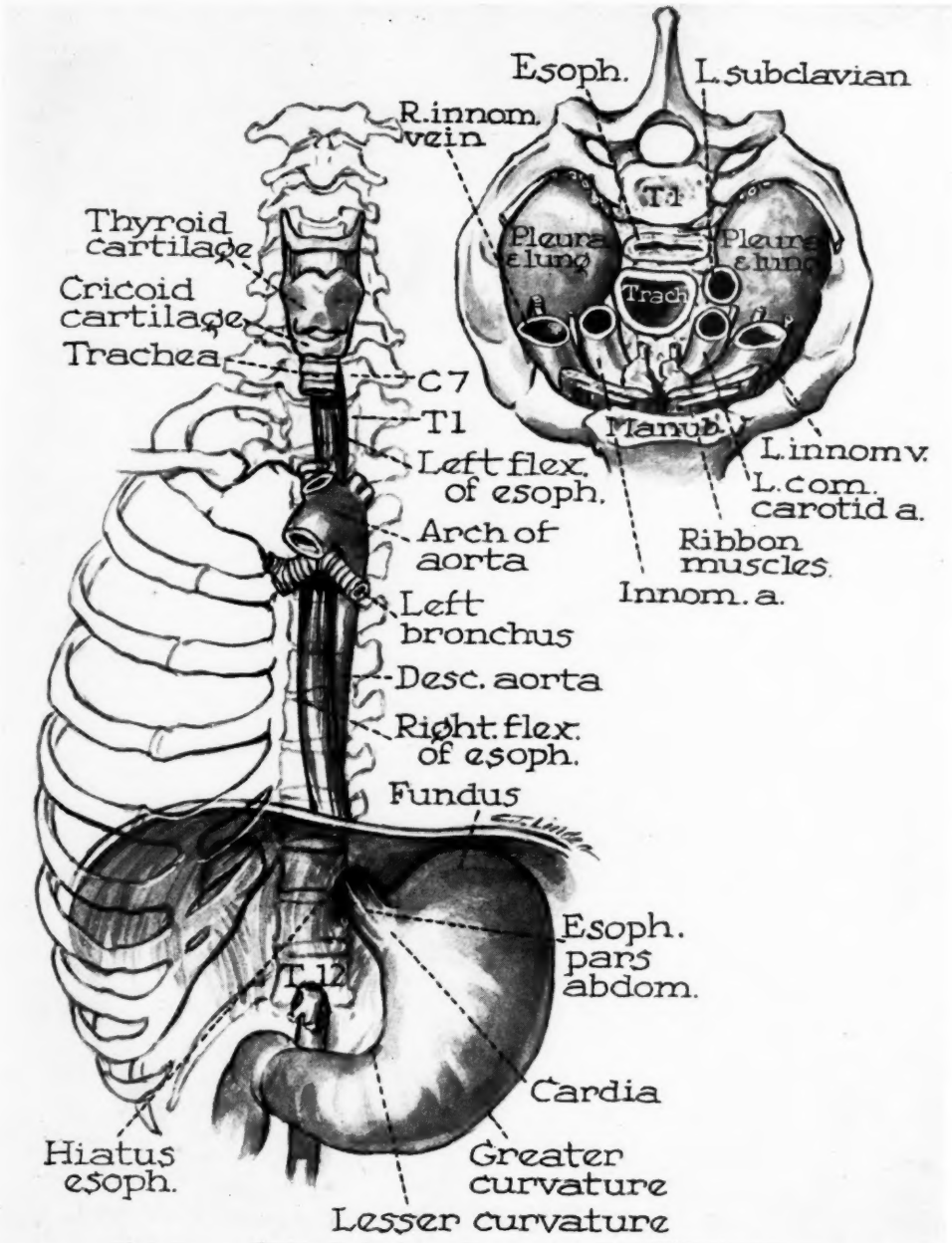


Fig. 1.—Surgical anatomy of the esophagus. Insert shows the relations seen from above at the thoracic inlet.

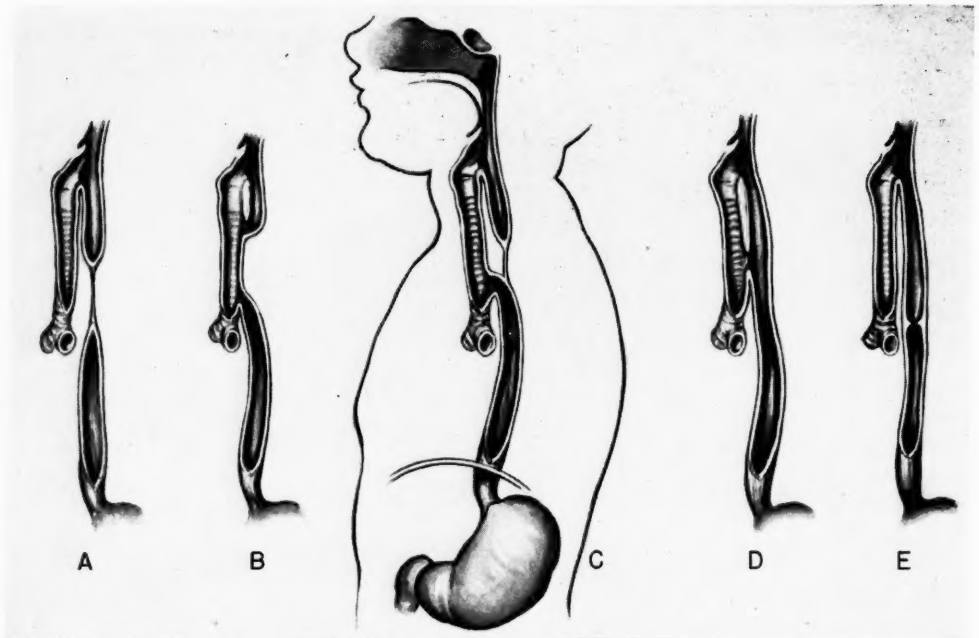


Fig. 2.—Congenital atresias and tracheo-esophageal fistulas. Various combinations of these may occur. The most common combination is that depicted in Figure 2*C*.

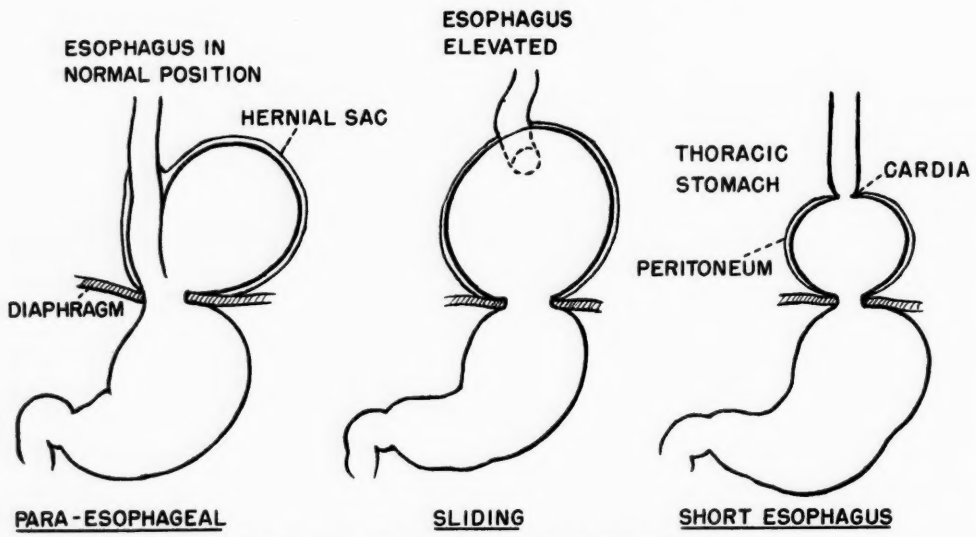


Fig. 3.—The three types of esophageal hiatus hernia.

ability to heal, particularly if careful sutures are placed and if tension is avoided.

CONGENITAL DEFECTS

Much has been learned recently about congenital atresias and tracheo-esophageal fistulas, so that now they can be properly classified and treated (Fig. 2). Various combinations and degrees of these anomalies are possible. The most common such defect is one in which the proximal end of the esophagus terminates as a blind pouch and the distal end joins the trachea to form a tracheo-esophageal fistula (Fig. 2 *C*). The other types of defects are depicted in the accompanying illustrations (*A*, *B*, *D* and *E*).

Such a defect is to be suspected if the newborn baby presents a symptom complex revealing the three "C's", namely, *coughing, choking* and *cyanosis*. Especially is this true if there is an abnormal amount of drooling and rhinorrhea. These symptoms should suggest an im-

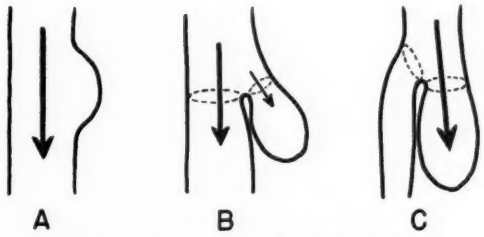


Fig. 4.—Pathologic physiology of esophageal diverticula.

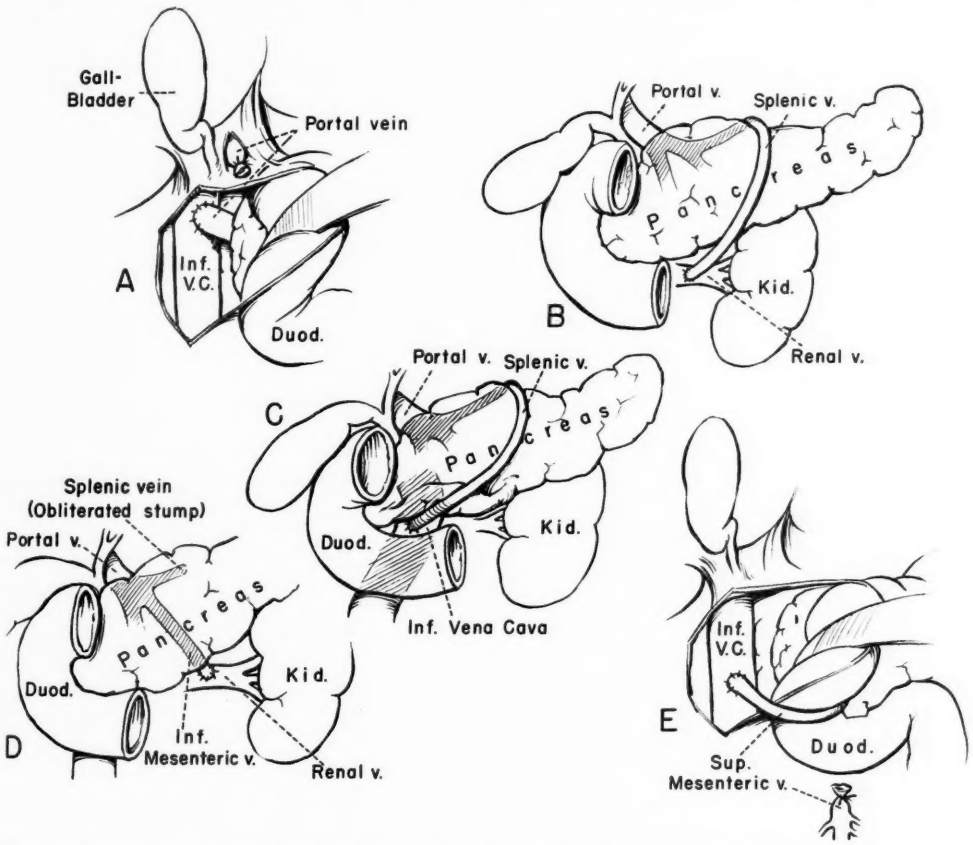


Fig. 5.—Various types of portacaval shunt. *A*, end-to-side portacaval shunt; *B*, splenorenal shunt; *C*, splenocaval shunt; *D*, inferior mesenteric renal shunt; *E*, superior mesenteric caval shunt.

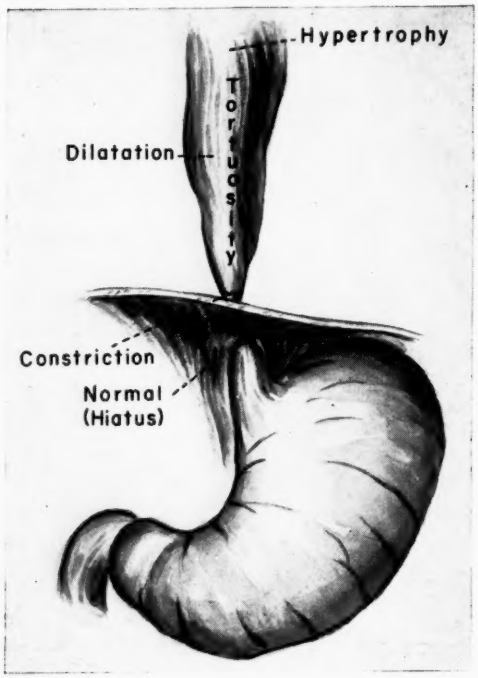


Fig. 6.—Cardiospasm (achalasia) of the esophagus.

pending surgical emergency. The roentgenologist is of inestimable value in determining the type and site of such lesions by merely noting the presence or absence of gas in the stomach and bowel, and by injecting a small amount of lipiodol through a nasal catheter into the proximal portion of the esophagus (barium should never be used).

The side of approach to atretic lesions and tracheo-esophageal fistulas is open to controversy. It is true that if only a small narrow atretic portion in the esophagus exists the right-sided approach is preferable. The reasons for this are that the arch of the aorta does not interfere with exposure, only the azygos vein need be ligated and severed to visualize the esophagus thoroughly, and an end-to-end anastomosis may be accomplished readily. However, if the atresia or the fistula involves a longer segment of esophagus, an end-to-end esophageal anastomosis cannot be accomplished. Thus if one has utilized a left-sided approach it is an easy matter to open the diaphragm, mobilize the stomach, and perform an intrathoracic esophagogastrostomy. It should be remembered also that in the newborn and in the young the aorta is not the barricading impediment that it is in older persons, since in the young it can readily be retracted out of the way.

If a few of these pertinent facts are kept in mind, not every "blue baby" will be thought to present the tetralogy of Fallot, and an immediate and proper work-up will be instituted, thus saving many such children from unnecessary deaths.

HERNIA OF THE ESOPHAGEAL HIATUS

A hernia of the esophageal hiatus is a diaphragmatic hernia in which the upper part of the stomach herniates through the esophageal hiatus. The following three types of esophageal hiatal hernias (Fig. 3) have been described: (1) the para-esophageal type, in which the stomach herniates through the esophageal hiatus and lies parallel to an esophagus of normal length; (2) the sliding type, in which the stomach is herniated through the hiatus but has pushed an esophagus of normal length upward, thus rendering it tortuous, and (3) the hiatal hernia with a congenitally short esophagus, in which the upper part of the stomach is herniated through the hiatus because the esophagus has never attained its normal length.

The last-mentioned type can be diagnosed by the esophagologist when he records the appearance of gastric mucosa at an unusually high level, indicating a short esophagus. Hiatal hernias may be observed as a coincidental finding in taking gastrointestinal roentgen films. Such hernias rarely if ever produce symptoms. Although many advocate leaving them alone, the danger of strangulation of such a herniated segment of stomach, with resulting putrid empyema and rapid death, must be kept in mind.

Many patients with hiatal hernias complain of epigastric distress, bloating, belching, anorexia, loss of weight and retrosternal pain. Such cases have been diagnosed erroneously as disease of the gallbladder, peptic ulcer, gastritis or coronary disease. These errors can be avoided if the possibility of hiatal hernia is kept in mind and if roentgen films are taken

with the patient in the Trendelenburg position, which would readily demonstrate herniation that might otherwise be overlooked.

The surgical repair of a para-esophageal hernia or a sliding type of hernia is simple, since all that is necessary is reduction of the herniated stomach and tightening of the esophageal hiatus. It is the hernia associated with a congenitally short esophagus that presents a problem. For such a lesion I have devised a procedure by which the hiatus is incised and enlarged and the defect increased. This is accomplished by herniating more stomach into the thoracic cavity, thus removing the pull on the congenitally foreshortened esophagus. The esophageal hiatus is then loosely sutured around the stomach.

ESOPHAGEAL DIVERTICULA

The time-honored classification of diverticula into pulsion and traction types is still of value. Surgically we are interested in the pulsion type of diverticulum, which occurs either in the neck (cervical) or immediately above the diaphragm (epiphrenic). The so-called traction type is usually located in the region of the tracheal bifurcation where the chronically inflamed tracheal lymph nodes are found. These rarely produce symptoms, since they usually have a wide ostium which forms their neck. However, more important than the classification is appreciation of the pathologic physiology which underlies the formation of this condition. It is believed that one of the prerequisites for the pulsion type is a weak-

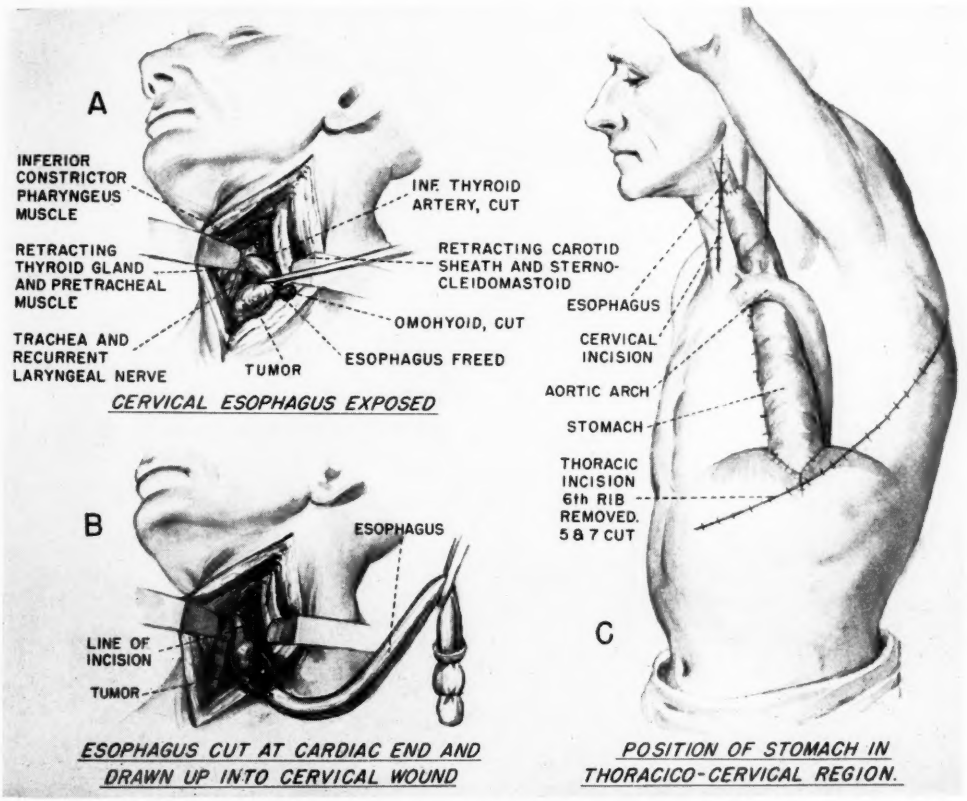


Fig. 7.—Surgical treatment for carcinoma of the cervical portion of the esophagus. Note that in *C* the stomach has been brought up behind the arch of the aorta.

ness in the muscular wall, which permits herniation of the mucosa through the weak part and results in a diverticulum. No symptoms are produced as long as the opening into the diverticulum is large. However, as food slowly packs into the diverticulum the latter increases in size and drops downward (Fig. 4). This process continues until the weighted sac hangs downward and produces pressure upon the esophagus, obstructing it. It should be noted that in such a far-advanced stage food has easier access to the diverticulum than to the esophageal lumen proper. Dysphagia is the outstanding complaint, and diverticulitis, perforation and mediastinitis are the more common complications.

In this day of chemotherapy, improved surgical technic, modern anesthesia and proper postoperative care, the one-stage diverticulectomy is preferred over the two-stage procedure. Although removal of the diverticulum is preferred, diverticulopexy still has its place. The latter procedure, in which the diverticulum is dissected free and stitched upward to the surrounding structures, is reserved for the poor risk patient with marked symptoms. When this has been done, food does not have access to the downward-hanging diverticulum and thus the symptoms are relieved.

PORTAL HYPERTENSION

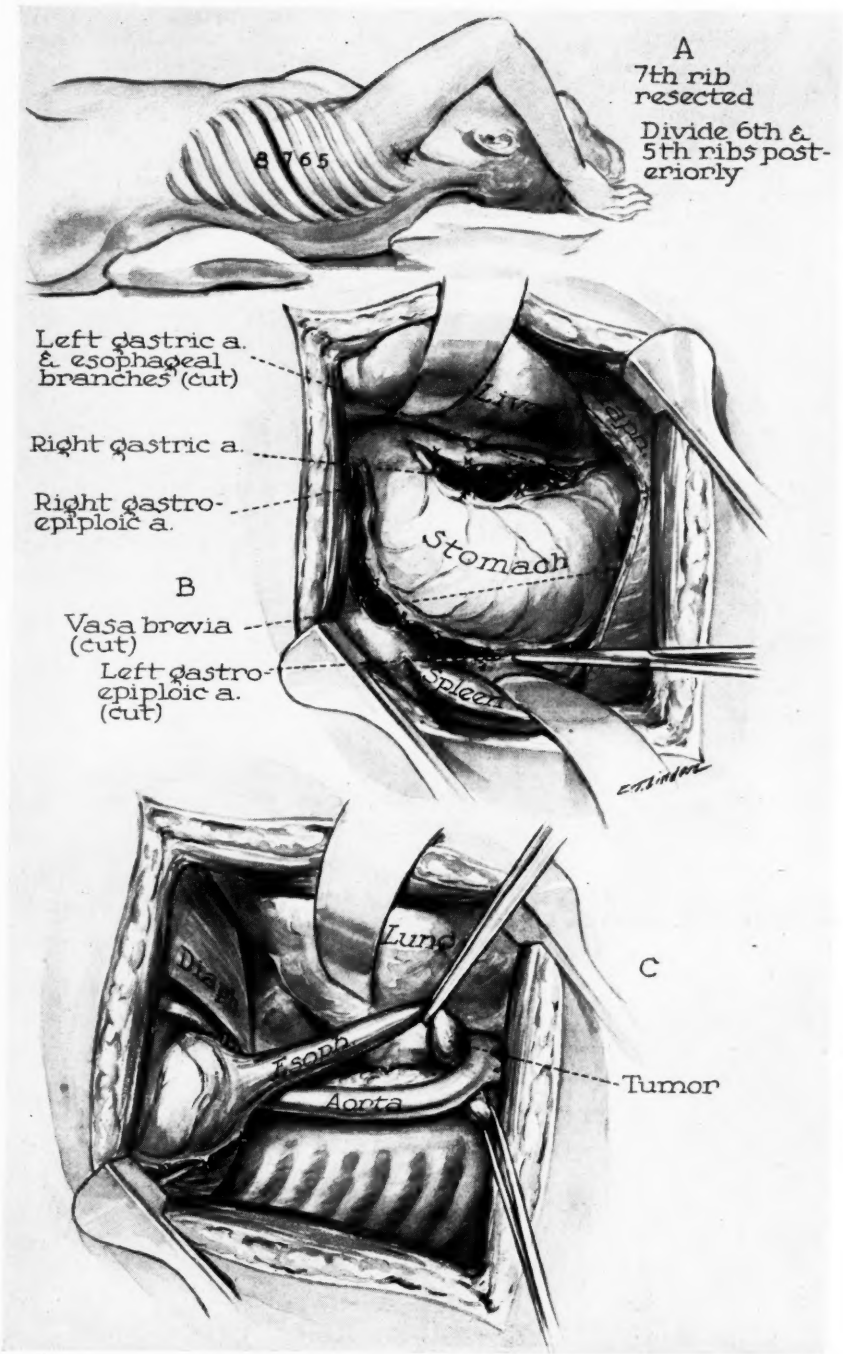
A ruptured esophageal varix presents a true surgical emergency that taxes the diagnostic ability, skill and judgment of the surgeon. This condition results from increased pressure in the portal system and is almost always observed at the lower end of the esophagus (recent studies reveal, however, that varices may occur in any part of the esophagus). Portal hypertension may be due to intrahepatic or extrahepatic causes. The usual condition causing intrahepatic block is cirrhosis of the liver. Extrahepatic block may be due to phlebitis, thrombosis, fibrous stenosis or cavernomatous transformation of the portal vein; it may be congenital or acquired.

One does not refer to Banti's disease in these modern times, but rather to Banti's syndrome. This is characterized by splenomegaly, anemia, esophageal varices, ascites and leukopenia. The syndrome has been produced experimentally by Whipple, who blocked the portal vein. If the block is due to an intrahepatic lesion the liver function tests will give positive results, whereas if the portal block is extrahepatic the results of these tests are usually negative. If the condition is in a quiescent stage it may be safe to take an esophagram, which will reveal the pathognomonic "beaded" appearance at the lower end of the esophagus.

Since hemorrhage from a ruptured esophageal varix may be fatal, definite measures must be taken to prevent recurrence. Some of the therapeutic procedures advocated are injection of the varix with sclerosing agents, tamponade with oxycel or gelfoam through the esophagoscope, ligation of the coronary vein, esophagogastric resection to remove the "pile-bearing" area, and various forms of portacaval shunts.

Portacaval shunts have attained a certain degree of popularity in the past few years, and various types of anastomoses have been attempted in order to shunt the blood from the portal to the caval system (Fig. 5). It is my opinion that, rather than the time-honored end-to-side portacaval shunt (Eck fistula), a lateral anastomosis between the portal vein and the inferior vena cava will prove to be the method of choice. This is accomplished best through a right thoracolaparotomy incision in which the costal arch is divided, making it possible to dislocate the right lobe of the liver into the right thoracic cavity. When this approach is used, the portal vein and the inferior vena cava practically approximate themselves,

Fig. 8.—Surgical treatment for carcinoma of the midthoracic portion (Zone 2) of the esophagus. *A*, the patient is placed on his right side with the left arm held forward and the left side of the chest arched upward. The incision begins at the left costal margin anteriorly, extends backward usually over the seventh rib, and ends by extending upward between the spinal column and the left scapula. A wide resection of the rib is accomplished by cutting its cartilage anteriorly and its neck posteriorly. *B*, the diaphragm has been divided and the lower end of the esophagus and the greater part of the stomach mobilized. *C*, the tumor and the esophagus are freed both above and below the arch of the aorta. (Courtesy of *Illinois Medical Journal.*)


A
7th rib resected
Divide 6th & 5th ribs posteriorly
8 7 6 5
Left gastric a. & esophageal branches (cut)
Right gastric a.
Right gastro-epiploic a.
Stomach
B
Vasa brevia (cut)
Left gastro-epiploic a. (cut)
Spleen
Lung
C
Tumor
Aorta

thus avoiding the necessity of dissecting out the common duct and the hepatic artery. It seems preferable also to permit some portal blood to continue through the liver rather than make a complete division of the portal vein. Only time will tell the efficacy of these measures.

CARDIOSPASM (ACHALASIA) OF THE ESOPHAGUS

Cardiospasm is a condition in which there is dilatation, hypertrophy and tortuosity of the esophagus unassociated with an obstructed esophageal hiatus (Fig. 6). Theories as to its production are numerous and will not be discussed here. This condition is twice as common in females as in males, and in a rather large percentage of cases a history of emotional strain or psychic trauma can be elicited.

The outstanding symptoms are dysphagia, regurgitation and pain. Complete esophageal obstruction for varying periods has been noted, even to a point where the patient cannot swallow his own saliva. The pain is usually retrosternal and varies from mild to severe. Morphine addiction has resulted from this condition.

The roentgen film is of particular help in diagnosing cardiospasm. Recently Kramer and Ingelfinger described the mecholyl test as an aid to the diagnosis of cardiospasm. When mecholyl, a parasympathomimetic drug, is injected into a normal person there is only a slight increase in tone and magnitude of esophageal contractions. However, in patients with cardiospasm, marked esophageal spasm and contractions follow administration of the drug. Complications that may be associated with the condition are bronchitis, bronchiectasis and pulmonary abscess. All of these may result from aspirated material regurgitated from the esophagus.

Medical management includes psychotherapy, antispasmodics and dilatation. Surgically many types of procedures have been advised, which include cardioplasties, cardiomyotomies, resections and anastomoses.

CARCINOMA OF THE ESOPHAGUS

No longer is a defeatist attitude assumed in cases of carcinoma of the esophagus. What was considered a hopeless and inoperable condition only a decade ago presents at least a worthwhile challenge to the surgeon of today. If present impressions are correct, the overall outlook and prognosis for the patient with carcinoma of the esophagus is better than the 5 per cent, five-year "cure" for carcinoma of the stomach.

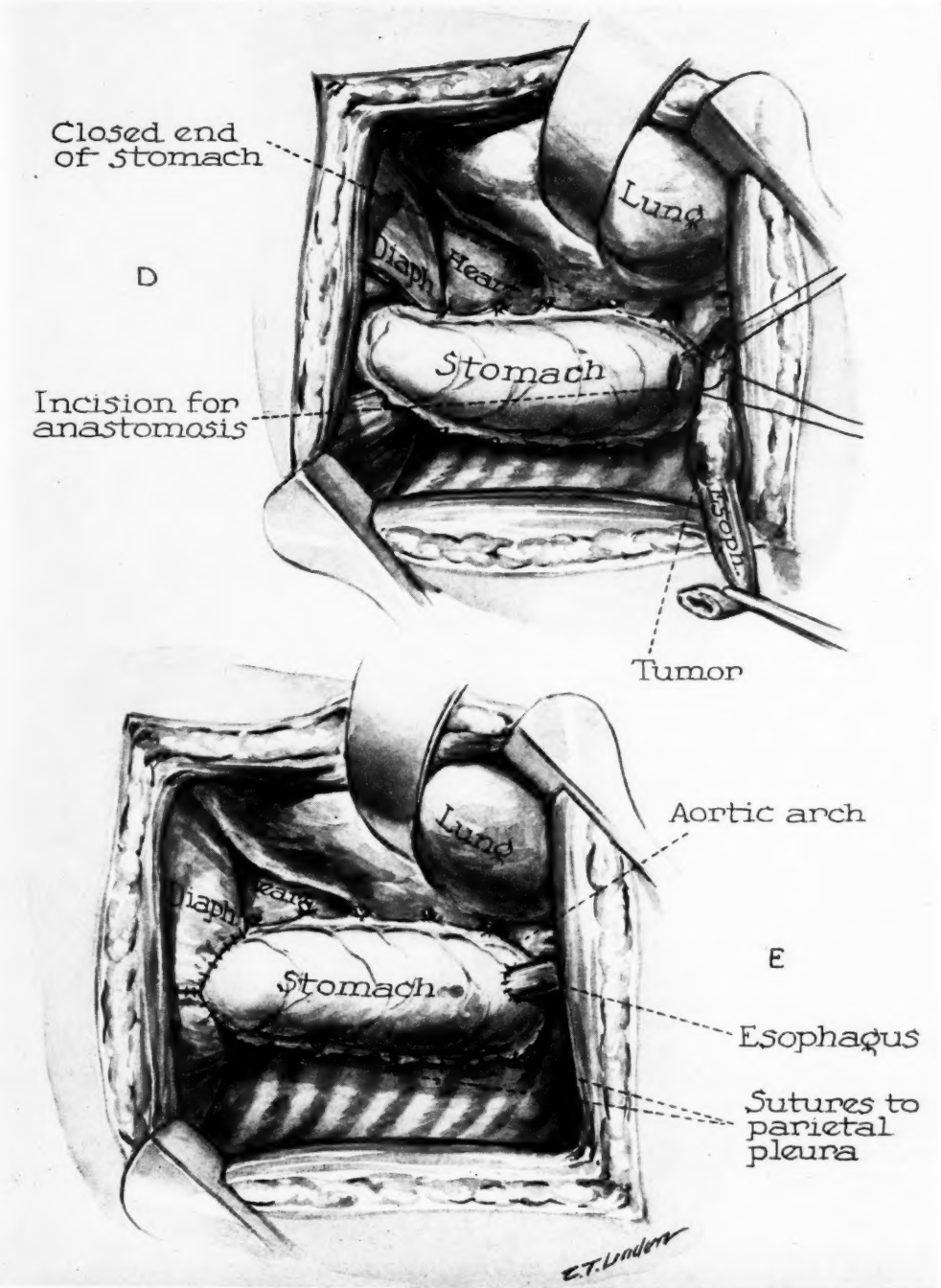
It is of practical value to divide the esophagus into zones. Many such divisions have been described. One that has served me well divides the organ into three zones, namely, an upper (Zone 1), which extends from the beginning of the cervical esophagus to the manubrium sterni; a middle (Zone 2), which extends from the manubrium sterni to the inferior pulmonary ligament, and a lower (Zone 3) from the inferior pulmonary ligament to the esophagogastric junction.

Early diagnosis is of paramount importance in cases of this type of carcinoma, since it is by this means that the survival rate can be increased. One often hears mention of a "change in stool habit" as a probable symptom of carcinoma in the lower intestinal tract; in like manner it may be stated that "any persistent change in the swallowing habit is an indication of carcinoma of the esophagus until proved otherwise." Were this dictum to be heeded and such cases further investigated by means of esophagoscopic and roentgen study, then many esophageal neoplasms would be operated upon earlier.

TREATMENT

Needless to say, preoperative and postoperative therapy for these patients is of the utmost

Fig. 8.—Surgical treatment for carcinoma of the midthoracic portion (Zone 2) of the esophagus (cont'd.) *D*, the stomach has been divided distal to the cardia and the gastric opening closed by two layers of sutures. The freed esophagus is brought over the arch of the aorta. The muscularis of the esophagus is approximated to the serosa of the stomach. An opening is made high on the gastric fundus. The tumor and the major portion of the esophagus are removed and the anastomosis completed. *E*, the diaphragm is repaired. To relieve tension upon the suture line, the stomach is sutered to the parietal pleura and the edges of the diaphragm are fastened to the gastric antrum. (Courtesy of *Illinois Medical Journal.)*


Closed end of stomach
Lung
Diaph
Heart
D
Stomach
Incision for anastomosis
Tumor
Lung
Aortic arch
Diaph
Stomach
E
Esophagus
Sutures to parietal pleura
E.T. Lindell

importance, and much has already been written concerning these phases.

For *lesions* located in *Zone 1* the Wookey procedure has been used, especially for a tumor situated in the cervical portion of the esophagus. Recently, however, lesions involving the superior mediastinal segment of the esophagus as well as the cervical part have been approached by a more radical procedure, which removes the thoracic portion of the esophagus and most of the cervical portion (Fig. 7). This is accomplished through a thoracic phase of the operation and a cervical phase. The operation is completed by an intracervical end-to-side esophagogastrostomy. In placing the mobilized stomach in the neck the surgeon may find that the thoracic inlet impinges upon the stomach. If this is the case it may be necessary to remove the inner half of the clavicle and the first rib. Whether the mobilized stomach should be placed behind or in front of the arch of the aorta is a moot question and must be decided by the surgeon at the time of operation.

Lesions of Zone 2, or those which involve most of the thoracic portion of the esophagus, are removed by a rather standardized procedure in which a wide esophageal resection is accomplished, followed by an end-to-side supra-aortic esophagogastrostomy or esophagojejunostomy (Fig. 8). When the jejunum is used it may be necessary to do a Roux "Y" anastomosis or some modification thereof.

Lesions of Zone 3 include not only the lower end of the esophagus but the gastric cardia as well. I prefer a thoracolaparotomy incision in which a left rectus incision extends across the left costal arch, dividing it and then continuing into the eighth intercostal interspace (Fig. 9). The diaphragm is divided to and through the esophageal hiatus, and the esophagus is mobilized from the aortic arch to its entrance into the stomach; the latter is then mobilized to the pylorus. The right gastric and gastroepiploic arteries should be left intact. An esophagogastric resection is then accomplished and is followed by an end-to-side esophagogastrostomy. If necessary the spleen and part of the pancreas are removed.

In most of my esophageal operations water seal drainage is preferred, and a Levine intragastric tube is permitted to remain in place for the first three postoperative days. I cannot subscribe to the teaching that these tubes may be harmful. Routine portable roentgenograms are taken twenty-four hours after operation to determine the pulmonary status.

PALLIATIVE PROCEDURES

Although the primary lesion may be extensive or may even show distant metastases, it is always worth while to attempt a palliative resection, thereby improving the patient's general condition and sense of well being. This is explained by the fact that infection is reduced and anemia is corrected. In the event that it is impossible to remove the primary growth, some short-cricuiting procedure, such as an esophagogastrostomy or an esophagojejunostomy may make the patient's remaining days more comfortable.

RUPTURE OF THE ESOPHAGUS

Both spontaneous and traumatic rupture of the esophagus have been described in the literature. A spontaneous rupture is an interesting lesion and is not so extremely rare as it was formerly thought to be. If one has the condition in mind it should be possible to diagnose it preoperatively. It is found most frequently in male patients who are victims of alcoholism, and is associated with a preliminary severe bout of vomiting; this is followed by agonizing pain, which may be either thoracic or abdominal. The patient usually goes into rapid and profound shock. This condition cannot be confused with a ruptured peptic (gastric or duodenal) ulcer, since with the ruptured ulcer the pain appears first and is followed by vomiting, whereas with the spontaneous rupture vomiting comes first and is followed by pain. The ruptured esophagus is associated frequently with surgical emphysema, which can be felt in the neck. Whenever such emphysema is noted one should think immediately of spontaneous esophageal perforation and verify this with a flat roentgen film, which will reveal a spontaneous hydropneumothorax. Aspiration of the chest has been done in some cases, resulting in the discovery of food particles or vomitus. Formerly the mortality was thought to be 100 per cent; however, with early diagnosis and modern surgical therapy the outlook is much better today, and some patients are definitely being saved.

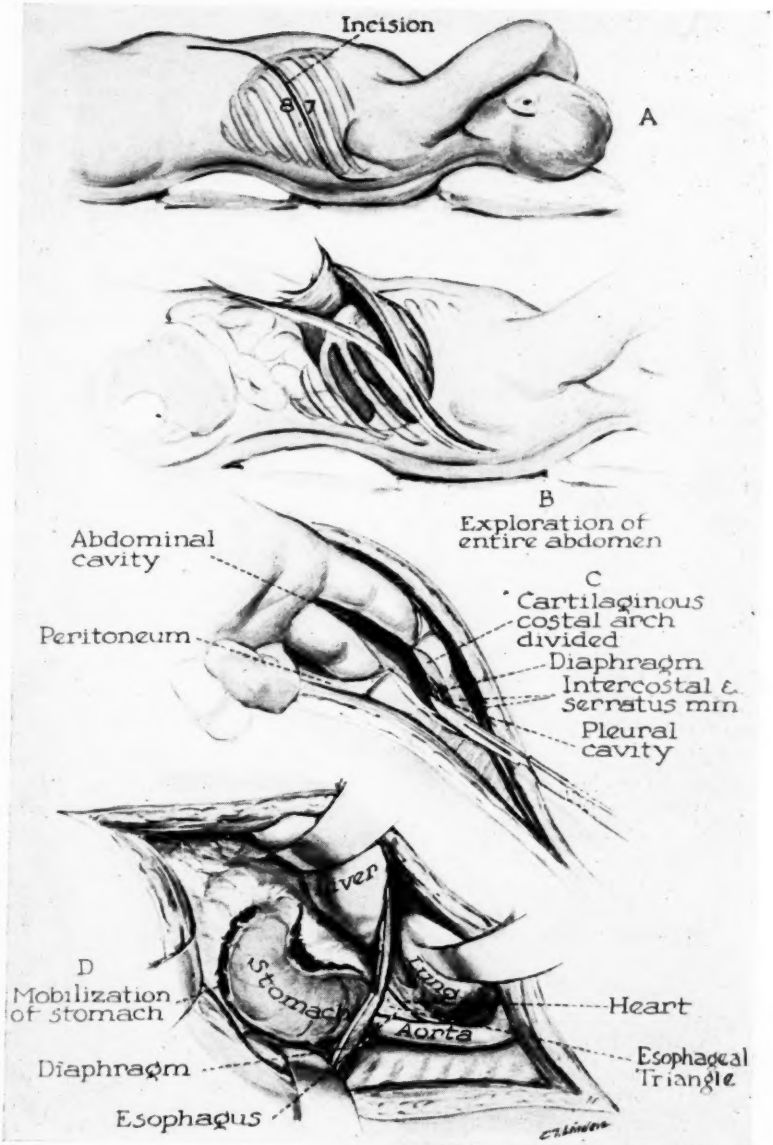


Fig. 9.— Surgical treatment for carcinoma of the lower end of the esophagus and upper end of the stomach (Zone 3). *A*, the patient is placed on his right side with a 5-degree inclination backward. The incision extends from 1 or 2 inches (2.5 to 5 cm.) below the umbilicus, over the inner third of the left rectus abdominis muscle, crosses the left costal arch, continues in the seventh intercostal interspace and then turns upward between the left scapula and vertebral column. *B*, the abdominal part of the incision is opened and thorough exploration is carried out to determine operability. *C*, the costal arch is severed, the intercostal muscles and pleura are divided and the pleural cavity is entered. The diaphragm is divided radially from the esophageal hiatus to its peripheral attachment. *D*, thoracico-abdominal exposure and identification of the esophageal triangle. (Courtesy of *Illinois Medical Journal.*)

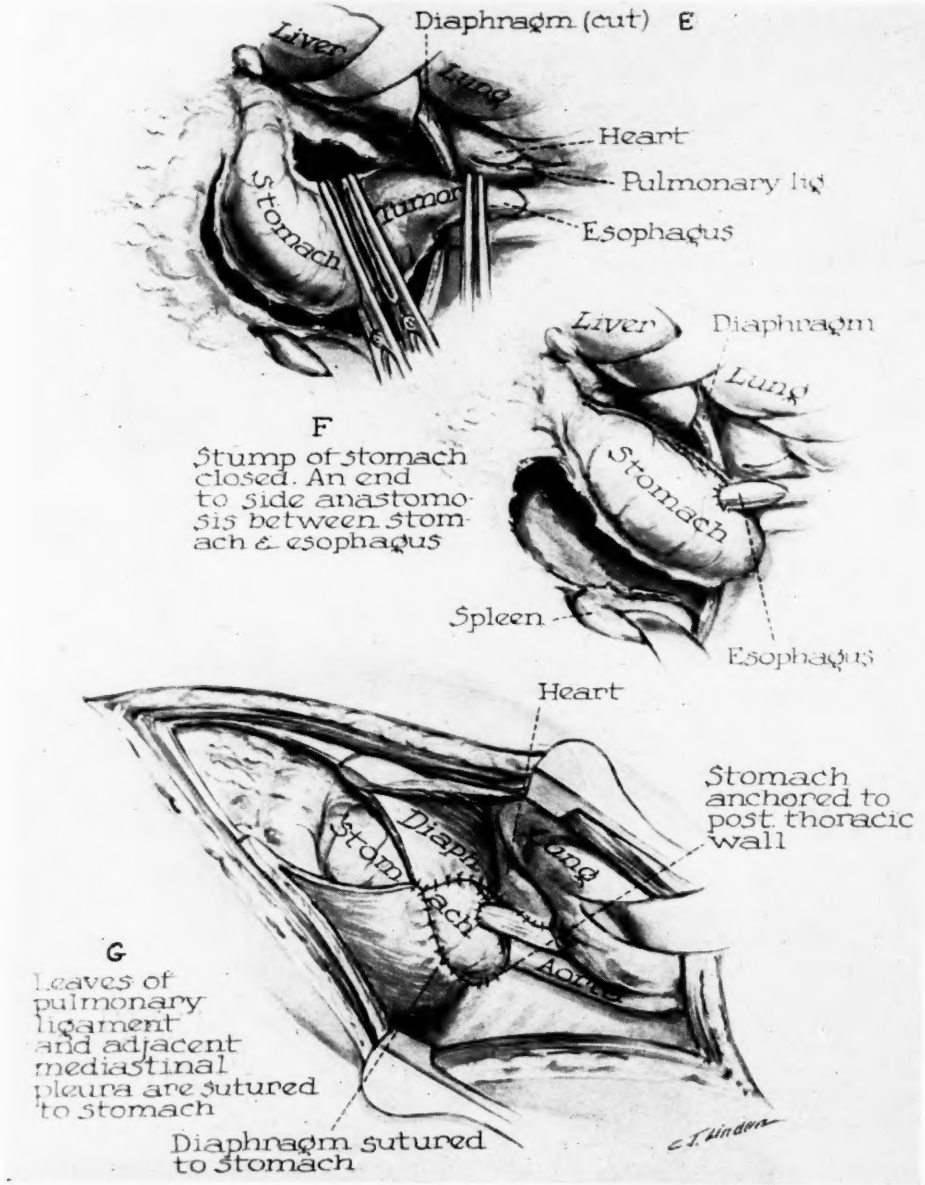


Fig. 9.—Surgical treatment for carcinoma of the lower end of the esophagus and upper end of the stomach (Zone 3), continued. *E*, removal of the tumor, including the lower end of the esophagus and the upper end of the stomach. *F*, supradiaphragmatic esophagogastrostomy completed. *G*, repair of the diaphragm and prevention of tension on the suture line by suturing the stomach to the diaphragm, the thoracic wall and the adjacent mediastinal pleura. (Courtesy of *Illinois Medical Journal.*)

MEDIASTINITIS

Perforation of the esophagus may result in a serious condition, mediastinitis. Malignant tumors or foreign bodies are the two main causes of perforation. Since carcinoma develops gradually, it does not give rise to as extensive an infection of the mediastinum as do other lesions.

Perforations caused by foreign bodies are of more practical importance. At present it is felt that mediastinal infections which extend deeper than the fourth or the fifth thoracic vertebra cannot be adequately drained by means of cervical mediastinotomy and must be treated by posterior mediastinotomy. Chemotherapy is an all-important adjunct for this type of infection.

BENIGN TUMORS

Benign tumors of many types have been found in the esophagus, the most common of which are lipomas and myomas. Owing to the constant effect of swallowing, such tumors have a tendency to become tremendously elongated and pedunculated. They have been known to be coughed up and to appear in the patient's mouth. If this occurs it may be possible to remove the lesion by means of a snare passed orally. If the tumor, however, is lower down, esophagotomy with removal of the tumor and primary closure of the esophagus is the treatment of choice.

In a presentation of this type it is impossible to mention every aspect of esophageal pathology. Only the more common and frequent conditions have been stressed. The esophagus has been just as much of a "hermit" as the pancreas; however, recently it has been brought within reach of the well equipped and well trained surgical team. That this organ is accessible to modern diagnostic and therapeutic procedures is due to the efforts of such men as Franz Torek, Sauerbruch, Garlock, Sweet, Nissen and others too numerous to mention. Their contributions have enabled the modern surgeon to save many lives that were doomed a decade ago. Today the future for esophageal surgery is most promising.

SUMMARY

The more common pathologic conditions which affect the esophagus have been discussed, and their treatments have been evaluated. The importance of physiopathology as an aid to early diagnosis has been stressed.

Since the advent of improved diagnostic methods, modern anesthesiology, chemotherapy, skillful surgical technic, and proper preoperative and postoperative care the esophagus has been brought into the realm of surgical safety.

RÉSUMÉ

Les possibilités d'opérer l'oesophage ont fait de gros progrès depuis que le chirurgien a eu à sa portée les techniques chirurgicales modernes. L'on guérit tous les jours des lésions que l'on considérait jadis inopérables et déséspéréees et les symptômes dus à des lésions vraiment inopérables sont amendés d'une façon remarquable et sans précédents.

Parmi les conditions pathologiques de l'oesophage l'on décrit les défauts congénitaux, la hernie de l'hiatus, les diverticules, le cardiospasme, l'hypertension portale, le carcinome, la rupture, les tumeurs bénignes et la médiastinite. L'auteur donne les grandes lignes de sa thérapeutique pour chacun de ces cas et base sa méthode sur les rapports anatomophysiologiques de l'oesophage, divisant cet organe en trois parties: Zone 1, la partie cervicale ou supérieure; Zone 2, la partie thoracique ou médiane et Zone 3, la partie abdominale ou inférieure.

Un paragraphe décrit les procédés palliatifs. L'importance du diagnostic précoce est soulignée.

RESUMEN

El adelanto de la ciencia y la técnica quirúrgicas ha modernizado e incrementado grandemente la accesibilidad del esófago al tratamiento quirúrgico. Las lesiones que antaño se consideraban inoperables y sin posibilidad de curación, pueden curarse en la actualidad, y los síntomas incurables debidos a las mismas pueden aliviarse hasta un grado verdaderamente sin precedente.

Entre los trastornos patológicos del esófago examinados por el autor figuran las trastornos congénitos, hernias del hiato, divertículo, cardioespasmo, hipertensión portal, carcinoma,

ruptura, tumores benignos y mediastínitis. El autor esboza el tratamiento de cada uno de ellos basado en las relaciones anátomofisiológicas del esófago y en la división de dicho órgano en tres zonas: 1. zona cervical; 2. zona media (torácica), y 3. zona inferior o abdominal.

Se incluye una sección dedicada a los tratamientos paliativos, prestándose gran atención a la importancia del diagnóstico precoz.

RIASSUNTO

La possibilita' di interventi chirurgici sopra l'esofago e' stata notevolmente favorita dai progressi realizzati nella tecnica operativa. Lesioni dell'esofago che apparivano nel passato inoperabili, incurabili, possono essere oggi guarite, mentre la cura palliativa di lesioni effettivamente incurabili ha raggiunto un' efficacia insperata.

Fra le tante lesioni, l'A. discute le anomalie congenite, l'ernia, i diverticoli, il cardiospasmo, l'ipertensione della vena porta, i carcinomi, la rottura, i tumori benigni e la mediastinite. Delinea inoltre la cura operativa seguita in ognuna di queste lesioni, basandosi sopra i rapporti anatomo-fisiologici e la divisione dell'esofago in tre porzioni: 1) la superiore (cervicale); 2) la media (toracica; 3) l'inferiore (addominale).

Accenna anche ai metodi palliativi. Richiama ancora una volta l'attenzione sopra la necessita' di una diagnosi precoce.

The United States Chapter of the
International College of Surgeons

announces the creation of Junior Membership in the College. The House of Delegates, meeting on Dec. 18, 1949, established this new form of membership, with the following requirements:

One year of internship in an approved hospital
One year as resident surgeon in a specific surgical training program

Applicants must be between 25 and 30 years of age. For further information, address

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Hypertension Treated by Subtotal Bilateral Adrenalectomy

JOSEPH L. DECOURCY, M.D., F.A.C.S., F.I.C.S.
CINCINNATI

MORE than a decade ago, in my earlier studies appraising subtotal bilateral adrenalectomy in the treatment of hypertension ("essential hypertension"), I was able to state: "Adrenalectomy for hypertension in properly selected cases has produced excellent results in our hands . . . We may even look forward with a considerable measure of confidence to eventually controlling, or wholly eradicating, many cases of hypertension which now go unrelieved to an early end. It is to be hoped that clinicians generally will give these surgical methods (sympathectomy and adrenalectomy) consideration and practical trial, for it is only in this way that we may amass sufficient data to confirm or invalidate our conclusions."[1]

Thus, in view of my own observations, as well as those reported in the literature, I have long maintained that subtotal bilateral adrenalectomy rather than sympathectomy affords the means to true progress in the surgical treatment of hypertension. Confirmation of this belief has been forthcoming from a review of the results in patients treated at the DeCourcy Clinic during more than twelve years and from recent studies, both experimental and clinical, which present new observations, facts and theories.[2]

Employing the operative procedures earlier described in detail,[3] our clinic has now a series of more than 30 cases in which subtotal bilateral adrenalectomy was performed in two stages, the interval between stages being three months. There has been no mortality from the procedure. After adrenalectomy in carefully selected cases of hypertension, subjective symptoms have disappeared promptly. This improvement has been permanent. Even in some of our early patients, who were far advanced in arteriosclerosis and concomitant pathologic changes, there occurred after adrenalectomy a sense of well-being, a gain in weight, and absence of dyspnea and headaches —although in a few patients, after the operation, the blood pressure rose toward its former level.

In more than 75 per cent of the cases of hypertension treated by two-stage subtotal bilateral adrenalectomy the blood pressure has been significantly reduced. In a few cases it has returned to normal and has remained normal over a period of years. We now have patients under observation for twelve years, with no return of hypertension.

Our favorable results, we believe, may be attributed largely to two factors: (1) careful selection of patients and (2) removal of approximately four-fifths of each gland—that is, the removal of about 8 Gm. of adrenal tissue at each of the two stages of the operation (the normal gland weighs about 10 Gm.). It has been well demonstrated that the removal of this seemingly large amount of pheochrome tissue is well within the limits of safety for the patient. Most surgeons have removed only one half of each adrenal—"bilateral hemiadrenalectomy" (Neuhof[2c]).

Confirmatory results have recently been reported by Neuhof, who commented: "The uncertain results obtained by sympathectomy in severe hypertension raise the question of the addition of unilateral or even bilateral hemiadrenalectomy in cases short of the most severe forms of hypertension. Finally, the influence of bilateral hemiadrenalectomy on blood pressure appears to be so salutary as well as distinctive that the question of employing the procedure alone for hypertension naturally arises. Theoretically, at any rate, subtotal adrenalectomy for hypertension appears to parallel subtotal thyroidectomy for Graves' disease."

The generally unsatisfactory results following sympathectomy in the treatment of hypertension have been emphasized by an increasing number of clinicians. The conclusions of Davis, Lindberg and Treger[2a] may be regarded as typical: "Sympathectomy alone has not been successful in permanently reducing the blood

pressure levels in the high diastolic type of hypertension regardless of the extent of the operation." Davis and his associates found that, in some cases in which there was preoperative resistance to thiocyanate therapy, sympathectomy caused the patient to become sensitive to this drug. In fact, there was "no significant change in the blood pressure levels or heart size, unless the patients of this group had been given thiocyanates postoperatively."

The rationale behind sympathectomy as a treatment for hypertension has been based upon the concept of overactivity of the sympathetic nervous system as an outstandingly important etiologic factor in this condition. Heinbecker[1] has presented impressive evidence that the primary cause of "essential hypertension" is a humoral mechanism, not overactivity of the sympathetic nervous system. According to Heinbecker, in the pathogenesis of essential hypertension there must, first of all, be a constitutional susceptibility of the hypothalamus to functional depression. Depression of the hypothalamic nuclei innervating the neural hypophysis causes overactivity of the hypophysial eosinophilic cells, and there results a trophic stimulation of the adrenal cortex. And, as Heinbecker stated, "The combined influence of the eosinophil cell-adrenal cortical hormone complex is to constrict the efferent glomerular arterioles of the kidneys, so as to result in a release of renin." Thus, the combined action of three hormones causes hypertension—"and also the arteriolar sclerosis and degeneration associated with it." Epinephrine is a factor in hypertension, because it stimulates the cerebral cortex of the frontal lobes. Hence: "Its decrease by sympathectomy of the adrenal medulla is considered to be the mechanism whereby the production of hormones concerned in the pathogenesis of essential hypertension are decreased. Its decrease is responsible also in large measure for the relief of symptoms of hypertension referable to the nervous system following sympathectomy of the adrenals."

Heinbecker expressed the conviction that "any beneficial effect to be obtained by removal of portions of the sympathetic nervous system in the treatment of essential hypertension is to be obtained when such removal results in a denervation of the adrenals and the kidneys" —which are "the only two organs capable of releasing humors concerned with the pathogenesis and symptomatology of hypertension and whose function can be modified by sympathectomy." Heinbecker therefore concluded:

"The removal of portions of the sympathetic nervous system more extensive than is required for denervation of the adrenals and the kidneys is unnecessary. It can have no influence on the causal mechanism of the essential hypertension. The temporary greater enlargement of the vascular bed effected thereby may cause the shunting of blood from the kidneys sufficient to impair their function, and, through the release of renin, accelerate the degenerative changes in the extrarenal blood vessels."

There is, indeed, considerable evidence that deficiency of renal blood flow results in production of renin by the kidneys and in hypertension (of renal origin[2b]). When extensive sympathectomy is performed, not only may there be direct impairment of blood flow through the kidneys by enlargement of the vascular bed, but the cardiac output may be decreased as well.[5]

The studies of Heinbecker are being accorded increasing attention. Although their final evaluation must wait extensive investigations, it would seem that his emphasis upon the limitations and potentially injurious effects of sympathectomy is well placed. It is also in a high degree noteworthy that the evidence indicating a primary role for the adrenal glands in the pathogenesis of hypertension is steadily growing. It seems possible that not only the medulla but the adrenal cortex is involved.

In short, the rationale for a direct attack upon overstimulated and overactive adrenal tissues—i.e., for subtotal bilateral adrenalectomy—in carefully selected cases of hypertension has been steadily strengthened. This surgical procedure, moreover, appears to be fully justified by the clinical results.

Certain similarities between subtotal bilateral adrenalectomy and subtotal bilateral thyroidectomy have long attracted the interest of this clinic. In both surgical procedures overactive endocrine tissue is removed, to effect a highly beneficial if not vital reduction in hormone production and consequent diminution of physiologic activity. In both hyper-

thyroidism and hypertension psychosomatic factors are believed to be involved, apparently playing primary etiologic roles. In the event that symptoms of hypothyroidism develop after thyroidectomy, thyroid extract may be prescribed. Similarly, if there is evidence of adrenal cortical hypofunction following adrenalectomy, recourse may be had to cortin therapy. At this clinic, however, we have never found it necessary to use cortex after subtotal bilateral adrenalectomy for hypertension.

Just appraisal of the results of subtotal bilateral adrenalectomy will ultimately depend upon clinical observations in comparable groups of patients. Classification is, of course, still far from perfect, and some confusion in the interpretation of results may be expected. It is obvious that statistics without proper classification of the different types of hypertension mean nothing. Many of the favorable results following sympathectomy for "essential hypertension" as reported in the literature would seem to be in cases of menopausal hypertension, in which improvement would naturally occur even in the absence of (or in spite of!) attempted therapy. Adrenalectomy is of undoubted benefit in cases in which the eyegrounds and other external manifestations indicate that the hypertensive condition is not far advanced. No clinician, however, is yet able to foretell which specific patient will be permanently benefited. Certainly the eyeground abnormalities are important, but we have found that even these are occasionally reversible.

When the fundus is normal, as it may be even in a patient with very high blood pressure, and when tests of renal function show that degenerative changes in the arterioles of the kidney have not rendered operative measures valueless, subtotal bilateral adrenalectomy may be indicated—provided, of course, that the characteristic symptoms and the clinical course also justify the surgical procedure. The permanent improvement in subjective symptoms, however, in some cases of advanced arteriosclerosis would seem to merit further consideration. It is worth remembering that there is indeed no such entity as "essential hypertension"—a term that merely covers lack of knowledge. Nevertheless, there is increasing evidence that the adrenal glands may be the key to the problem of surgical therapy and perhaps the key factor in etiology. If adrenalectomy is performed on well chosen patients, there seems to be no reason to fear the outcome. A gratifyingly high percentage of favorable results may be confidently expected.

SUMMARY AND CONCLUSIONS

1. Subtotal bilateral adrenalectomy is of undoubted benefit in the treatment of hypertension in properly selected cases.

2. Subtotal surgical removal of the adrenal glands is best done as a two-stage operation, four-fifths of each gland being removed with an interval of three months between operations.

3. In a series of more than 30 cases of hypertension treated by this surgical procedure there has been no mortality. Subjective symptoms have disappeared promptly, and this improvement has been permanent. In more than 75 per cent of the cases the blood pressure has been significantly reduced. In some cases the blood pressure has returned to normal and remained normal over a period of twelve years.

4. The evidence indicating a primary role of the adrenal glands in the pathogenesis of hypertension is steadily increasing, and the rationale for subtotal bilateral adrenalectomy in carefully selected cases has been correspondingly strengthened.

5. This surgical procedure, rather than sympathectomy, would seem to afford the means to true progress in the surgical treatment of hypertension.

RÉSUMÉ ET CONCLUSION

1. La résection subtotale bilatérale de la glande surrénale présente de gros avantages dans la thérapeutique de l'hypertension dans des cas bien choisis.

2. L'ablation chirurgicale subtotale des glandes surrénales devrait être faite de préférence durant une opération en deux stades, les quatre-cinquièmes de chaque glande étant prélevés avec un intervalle de trois mois entre les deux stades de l'opération.

3. Il n'y a pas eu d'issue fatale dans une série de 30 cas d'hypertension traitée par cette méthode opératoire. Les symptômes subjectifs ont disparu rapidement et cette amélioration est demeurée durable. Dans plus de 75% des cas, la pression sanguine baissa de façon im-

portante. Dans quelques cas, la pression sanguine revint à la normale et est demeurée normale pendant une période de douze années.

4. Les faits indiquant le rôle primordial des glandes surrénales dans la pathogénie de l'hypertension augmentent constamment et les bases rationnelles pour la résection subtotale bilatérale de cette glande pour des cas triés avec soin, en sont donc renforcées.

Ce procédé chirurgical, plutôt que la sympatecthectomie parait donc offrir l'espoir de progrès importants dans la thérapeutique chirurgicale de l'hypertension.

RESUMEN Y CONCLUSIONES

1. La adrenalectomía bilateral subtotal es, indudablemente, beneficiosa en el tratamiento de casos seleccionados adecuadamente de hipertensión.

2. La mejor manera de realizar la extirpación quirúrgica subtotal de las glándulas suprarrenales es dividiéndola en dos partes, esto es, extirpando cuatro quintos de la glándula cada vez, y dejando transcurrir un intervalo de tres meses entre las intervenciones.

3. En una serie de más de 30 casos de hipertensión tratados por este procedimiento quirúrgico no se registraron casos de mortalidad. Los síntomas subjetivos desaparecieron rápidamente, y la mejoría fué permanente. En más del 75 por ciento de los casos se redujo notablemente la presión sanguínea. En algunos casos la presión sanguínea retornó a la normalidad, permaneciendo así durante un período de 12 años.

4. Las pruebas indican que la importancia del papel de las glándulas suprarrenales en la patogenia de la hipertensión va en aumento y que se está aconsejando cada vez más la adrenalectomía bilateral subtotal en casos cuidadosamente seleccionados.

5. Este procedimiento quirúrgico, de preferencia a la simpatectomía, ofrece el modo de realizar un verdadero progreso en el tratamiento quirúrgico, de la hipertensión.

RIASSUNTO

1. L'adrenalectomia subtotale bilaterale e' benefica in alcuni casi, bene selezionati, di ipertensione arteriosa.

2. L'operazione va preferibilmente eseguita in due tappe: fra le due operazioni, che asportano ogni volta 4/5 della ghiandola, e' bene lasciare un intervallo di 3 mesi.

3. In 30 casi cosi' operati, non si e' verificato un solo decesso. I sintomi soggettivi sono scomparsi subito: il miglioramento e' persistito indefinitamente. Nel 75% dei casi la pressione del sangue si e' abbassata notevolmente. In alcuni casi la pressione e' ritornata normale ed e' rimasta tale per oltre 12 anni.

4. I dati che comprovano una fondamentale partecipazione della surrenale nella patogenesi dell'ipertensione si vanno rapidamente moltiplicando, giustificando sempre piu' le ragioni per un'adrenalectomia subtotale bilaterale.

5. La cura chirurgica dell'ipertensione sembra quindi destinata a passare dalla simpatectomia all'adrenalectomia. Questo passaggio segna un vero, effettivo progresso.

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The Surgical Aspects of Hematemesis and Melena

P. T. CRYMBLE, F.R.C.S. (ENG.), F.I.C.S. (HON.)*
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SINCE 1928, when I performed a partial gastrectomy on a young man who appeared to be dying from a bleeding gastric ulcer and death actually ensued in forty-eight hours, I have adopted the following Creed and preached it for nineteen years. The opportunity to practice it was not presented until 1946. My Creed is as follows:

Fatal hemorrhages take place from the left gastric artery or from the gastroduodenal artery. Where the bleeding is due to a gastric ulcer, the left gastric artery should be ligated near its origin. Where the bleeding is due to a duodenal ulcer, one should ligate the gastroduodenal artery if one can find it.

A recent case enabled me to put this Creed into use.

REPORT OF CASE

B. H., a man aged 22, was admitted to the Ministry of Health Emergency Hospital, Belfast, in June 1946, with a six-month history of pain in the lumbar part of the spine. Roentgen examination revealed caries of the fourth lumbar body, and he was placed on a plaster bed in full lordosis. Subsequently a right psoas abscess developed.

August 16, 1947—Dyspepsia appeared in the form of pain twenty minutes after taking food; relieved by ulcer diet and alkalis.

September 2: First hematemesis: bright red blood, 3 hemoglobin, 74 per cent.

September 9: Blood transfusion (drip): 2 pints (0.9L.).

September 10: Milk drip via Ryles tube; hemoglobin, 94 per cent.

September 11: Second hemorrhage, 3, blood mixed with milk; pulse rate 150.

September 12: Hemoglobin, 40 per cent.

September 14: Blood transfusion (drip): 1 pint (473 ml.).

September 16: Third hematemesis; coffee grounds and 31 ounces (85 Gm.) blood. Seen by me and further medical treatment advised.

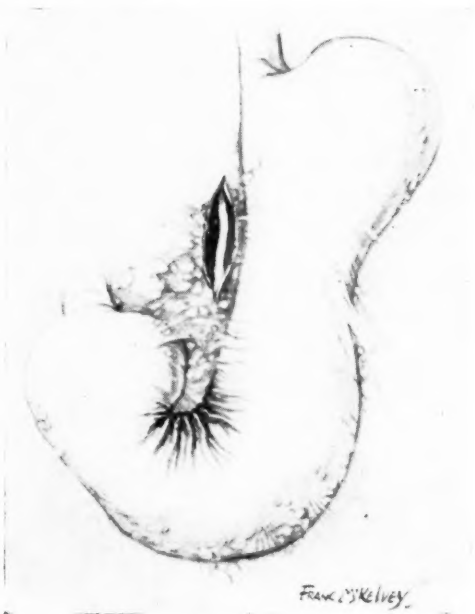
September 22: Hemoglobin, 37 per cent.

September 23: Fourth hematemesis, food and blood mixed; pulse rate 150.

September 24: Patient seen by me and operation arranged for following day. Pulse rate, 120; hemoglobin, 30 per cent. Blood transfusion (30 drops per minute) started and continued for forty-eight hours, before, during and after operation.

September 25: Operation, 4 p.m. Anesthesia induced with pentothal, nitrous oxide, oxygen, cyclopropane, tubarine hydrochloride 15 mg. Right paramedian incision made. Stomach revealed:

(a) An unusual development of vessels radiating laterally, medially, and downward on the anterior wall of the stomach from a point on the lesser curve, 1 inch (2.5 cm.) from the incisura angularis, and on the cardiac side. One large leash of vessels descended from this same area on the posterior surface of the stomach and was seen after blunt dissection of an avascular part of the lesser omentum.



Artist's representation.

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(b) An increased deposit of subperitoneal fat on the aforedescribed portion of the lesser curvature.

(c) No palpable fixation of the lesser curve and no palpable ulcer crater. Some thickening of the lesser curvature in the suspected area.

(d) A duodenum normal to inspection and palpation.

Eight vascular strands were ligated as they radiated from the suspected area, seven on the anterior and one on the posterior surface. These vessels seemed to disappear from view by penetrating the muscular coat. Some of them were veins accompanied by arteries.

The left gastric artery was now sought on the lesser cardiac curvature. An opening was made in the anterior layer of the lesser omentum, and with surgeon's left thumb in this opening and his left forefinger in the bursa omenti minoris, the pulsating artery was palpable. It could be separated from the lesser curvature and was the size of the radial artery. A path around it was made by a dissector, and along this an aneurysm needle was passed. The artery was now ligated with strong silk and the abdomen closed. The operation lasted about half an hour, and the patient appeared to be none the worse for it.

September 26: Blood drip discontinued, six pints (2,836 ml.) having been given. Hemoglobin, 64 per cent; pulse rate, 116.

September 27: Pulse rate, 120. Tongue dry; patient sweating profusely and not drinking well. Intravenous saline drip started.

September 28: Better. Drip discontinued after administration of HL. Vitamin C, 2 mg. daily.

September 29: Patient vomited 3iii altered blood. Hemoglobin, 30 per cent. Blood drip restarted.

September 30: Drip stopped. Ferrous sulfate started by mouth. Pulse rate 110.

October 2: Pulse rate 88.

October 3: Pulse rate 84. Hemoglobin, 47 per cent.

October 10: Pulse rate 80; hemoglobin 50 per cent; patient feeling well and taking full light diet.

November 6: Hemoglobin 89 per cent; red blood cells, 4,710,000 per cubic millimeter.

Table 1 summarizes cases of hematemesis or melena from the medical wards of the Royal Victoria Hospital, Belfast, between 1937 and 1946.

TABLE 1.—*Analysis of Case Records*

Number of cases	307
Medical recoveries	274 (89%)
Medical fatalities	30 (9.7%)
Surgical recoveries	2
Surgical fatalities	1

MEDICAL FATALITIES

Twenty-two of these were hopeless from the surgical point of view, for one or more of four reasons: (*a*) death on the day of admission or the day after; (*b*) bleeding from a ruptured varicose vein at the lower end of the esophagus, secondary to cirrhosis of the liver; (*c*) advanced age (70 or over), and (*d*) sudden death during what was apparently good progress.

Eight of these deaths might have been prevented by an operation.

1. William H., 44: Epigastric pain for five weeks. One hemorrhage. Died two weeks after admission. Autopsy revealed ulcer of the lesser curvature with an eroded vessel in its base.
2. Annie C.: Recent hematemesis. Death one week after admission. Autopsy revealed a ½ inch (1.2 cm.) ulcer of the lesser curvature ulcer, 3 inches (7.5 cm.) below the cardia.
3. Woman, 57: Indigestion one week. Hematemesis on day of admission. Melena. Hemoglobin 30 per cent. Death two weeks after admission. No postmortem.
4. Robert S., 65: Indigestion forty years ago. Hematemesis seven years ago. Five recent bleedings, and death on the fifteenth day after admission.
5. John B., 58: Indigestion off and on for eleven years. Pain after food; melena. Two months earlier, treated for duodenal ulcer. Hemoglobin 24 per cent. Death on the nineteenth day after admission. No postmortem, but one suspected bleeding from the gastroduodenal artery.
6. Samuel W., 57: Severe epigastric pain for six weeks. Melena and black vomitus four days before admission. Died on the fifth day. No postmortem, but bleeding from the gastroduodenal artery suspected.
7. James S., 52: Died two weeks after admission for hematemesis. History suggests duodenal ulcer.
8. Man, 50: Ulcer trouble for years. Six recent recurrent hematemeses. Pulse rate 104 or less; hemoglobin, 25 per cent.

MEDICAL RECOVERIES

Twenty-five of the 274 medical patients who recovered left the hospital with a pathologic condition of the upper part of the abdomen, suitable for surgical treatment. Many physicians take the view, and quite rightly, that if an operation is necessary it should be postponed until the patient has fully recovered from the bleeding. Fifteen of the 25 were suffering from obstruction to gastric outflow from the stomach and would have benefited subsequently by gastroenterostomy; 4 had gallstones, removal of which might have prevented further bleeding; 4 had gastric ulcers suitable for partial gastrectomy; 1 required appendectomy, and 1 required thorough examination, including laparotomy.

CLINICAL DATA

Duration of Symptoms.—In 164 of the cases, symptoms of stomach trouble had been present for one to thirty years. The symptoms included epigastric pain, vomiting hematemesis or melena.

Tubercular Disease.—Twenty-nine of the patients had a history of some tubercular condition—pleurisy, hemoptysis or skeletal disease.

Family History.—A history of "stomach trouble" in near relatives was obtained in 11 cases. This included perforations, pyloric obstruction, gastric ulcer and hematemesis.

Previous Operations.—Twenty-one of the patients had a history of previous operation on the stomach. In 9 of these gastroenterostomy had been performed, and in 5 a perforation had been closed. In the remainder the nature of the operation is unknown.

Trauma.—Two patients traced the hematemesis to injury.

Banti's Disease.—This condition accounted for 4 cases, and it is interesting to note that in all 4 the spleen had been removed previously, without stopping the hematemesis.

ROENTGEN DATA

One hundred and sixty-eight of the patients were examined by opaque meal and roentgen study, with the following results:

Normal	87
Duodenal ulcer	55
Ulcer of lesser curvature	16
Gallstones	3
Gastroenterostomy	4
Pyloric neoplasm	2
Death	1

Roentgen films are a valuable guide to the source of the bleeding, but the patient may be too ill for this examination, and the opaque meal may fail to show any ulcer. The absence of a positive roentgen report should not deter the surgeon from operating, as he should be able to rely on the living pathologic picture to distinguish between a gastric and a duodenal ulcer.

DIFFICULTIES IN PROGNOSIS

The following 2 cases illustrate the difficulties in placing or omitting to place a case on the danger list. The first was a case of unexpected recovery. James K., aged 56, had had symptoms for twenty years and hematemesis nineteen years before he was examined here. There were two recent attacks of bleeding, one before admission and one after.

15/9/46—Hemoglobin, 21 per cent
16/9/46—Blood transfusion
19/9/46—Blood transfusion
21/9/46—Hemoglobin 18 per cent; pulse rate 124; blood transfusion
24/9/46—Hemoglobin 30 per cent; rapid recovery

The second was a case in which unexpected death took place: Henry H., 53, had had epigastric pain for four months, relieved by food.

TABLE 2.—*Analysis of Autopsy Reports in 18 Cases of Fatal Hematemesis**

Male patients	14
Female patients	4
Aged 70 or over	4
Under 40	1
Bleeding from left gastric artery	7
Bleeding from gastroduodenal artery	10
Cancer	1
Tubercular disease of lung, or pleurisy	3
Trauma	1
Gastroenterostomy (recent, 2; old, 1)	3
Recent or old perforation	2
Might have been prevented	2
Might have been saved	8

*Autopsies performed in the Pathology Department of the Royal Victoria Hospital, Belfast, from 1937 to 1947.

There had been one attack of melena and hematemesis before admission, but no recurrence. The pulse rate never exceeded 120, nor did the hemoglobin level ever sink below 35 per cent. The patient died two weeks after admission.

GENERAL COMMENT

Worthy of especial note are:

A. The preponderance of males (14 to 4).

B. The patients who might have been saved by ligation of an artery without gastrotomy or gastrectomy (8 of 18).

1. Woman, aged 64: Died on fourth day from left gastric bleeding. Ligation of the left gastric artery might have saved her.
2. Man, aged 59: Died on thirteenth day from gastroduodenal bleeding. Ligation of the gastroduodenal artery plus a gastroenterostomy might have prevented death.
3. Man, aged 67: Died on ninth day after successful gastroenterostomy performed for relief of pyloric hourglass contraction and duodenal ulcer. Death was due to hemorrhage from the duodenal ulcer and might have been prevented by ligating the gastroduodenal artery at time of gastroenterostomy.
4. Man, aged 47: Died nine days after admission, from bleeding duodenal ulcer. Might have been saved by ligation of gastroduodenal artery.
5. Man, aged 47: Died on fourth day from bleeding duodenal ulcer. Might have been saved by ligation of gastroduodenal artery.
6. Man, aged 48: Died from bleeding of the lesser curvature. Suitable case for ligation of left gastric artery.
7. Woman, aged 53: Died on sixth day from a bleeding ulcer of the lesser curvature. Suitable case for ligation of left gastric artery.
8. Man, aged 50: Died on ninth day from bleeding duodenal ulcer. Suitable case for ligation of gastroduodenal artery.

C. Deaths that might have been prevented:

1. Man, aged 50: Duodenal perforation closed six months before hemorrhage. Death two days after admission from bleeding duodenal ulcer. Posterior gastroenterostomy plus ligation of gastroduodenal artery two months after the perforation might have prevented fatal bleeding.
2. Man, aged 33, with a five-year history of severe dyspepsia: Died on second day from a large bleeding pyloric ulcer. An early partial gastrectomy might have prevented the onset of bleeding.

D. Deaths following gastroenterostomy:

1. Death due to peritonitis following gastroenterostomy for relief of bleeding duodenal ulcer.
2. Death from bleeding duodenal ulcer nine days after gastroenterostomy for relief of pyloric hourglass contraction.
3. Gastroenterostomy sixteen years before. Death on day after admission from bleeding duodenal ulcer. Note persistence of duodenal ulcer in presence of a gastroenterostomy.

E. Recent or old perforations of duodenum:

1. Patient with duodenal perforation closed six months before admission. Died on second day from erosion of gastroduodenal artery.
2. Man, aged 69: Died on day after admission from perforated duodenal ulcer, complicated with bleeding from the ulcer.

SUMMARY AND CONCLUSIONS

1. A patient with dangerous recurrent hematemesis was restored to convalescence by ligation of the left gastric artery near its origin.

2. The living pathologic picture disclosed at operation enabled the surgeon to recognize the bleeding area.

3. Hematemesis and melena as treated in the medical wards carry a mortality rate of 9.7 per cent.

4. Of the 30 medical fatalities in a series of 307 cases of hematemesis or melena, 8 might have been prevented by operation.

5. Recognition of the dangerous condition suitable for surgical intervention is a difficult problem, as some patients die who appear to be progressing satisfactorily, and others recover (without operation), who seem to be going steadily downhill. If one rules out the hopeless group—patients over 70, patients who die in the first two days, patients with esophageal varices—one is left with a small group,

who exhibit the following features: age under 70; recurrent hematemesis in spite of blood drips, milk drips, and Witts diet; hemoglobin values below 30 per cent; pulse rates persisting around 120. This is the group suitable for ligation.

6. As a middle course between medical treatment, pure and simple, and gastrectomy, one might suggest Operation Ligature.

7. A study of the autopsy reports in 18 cases of fatal bleeding from the stomach or duodenum suggests that in 8 of these cases the condition was suitable for ligation.

8. Twenty-five of the 274 medical patients who recovered left the hospital with a pathologic condition of the upper part of the abdomen suitable for surgical treatment at some subsequent date.

9. Attention is drawn to the formation of new subperitoneal venous channels in the region of a gastric ulcer. The normal routes of venous return are obstructed by thrombosis, and the new diversion routes are a guide to the surgeon.

RÉSUMÉ

L'hématémèse sanguine et le mélena sont les complications citées de l'opération pour l'ulcère gastrique et des statistiques probantes sont inclues. Le credo chirurgical de l'auteur est le suivant: "Les hémorrhagies fatales prennent leur origine dans l'artère gastrique gauche ou dans l'artère gastroduodénale. Si l'hémorrhagie est due à un ulcère gastrique, l'artère gastrique gauche doit être ligaturée à sa naissance. Si l'hémorrhagie est due à un ulcère duodénal, on doit ligaturer l'artère gastroduodénale si on peut la trouver."

RESUMEN

El autor estudia la hematemesis y melena como complicaciones de la intervención para tratar la úlcera gástrica, agregando ciertas estadísticas sobre este problema. El autor expone su "credo quirúrgico" personal: "Las hemorragias fatales se producen en la arteria gástrica izquierda o en la arteria gastroduodenal. Si la hemorragia se debiera a una úlcera gástrica, debe ligarse cerca de su origen la arteria gástrica izquierda. Si la hemorragia se debe a una úlcera duodenal, debe ligarse la arteria gastroduodenal, si puede encontrarse."

RIASSUNTO

Discute ematemesi e melena quali complicazioni delle operazioni per ulcera gastrica: riporta statistiche al riguardo. Emorragie fatali derivano dall 'arteria gastrica sinistra e dall'arteria gastro-duodenale. Se l'emorragia e' dovuta ad un 'ulcera gastrica, l'arteria gastrica sinistra va legata in vicinanza della sua origine. Se deriva invece da un 'ulcera duodenale, s'impone—se possibile—la legatura dell 'arteria gastroduodenale.

I should like to thank Dr. McVickler, Dr. Fenton, and Mr. Bennett for the very efficient blood transfusion service; Dr. Miller, the anesthetist; the physician, Dr. Strong, who referred the case to the surgeon; and Mr. Frank McKelvey, R.H.A. who painted the illustration from a sketch made by the surgeon.

It is with profound regret that we note, as we go to press, the demise of Dr. Victor Román y Reyes, President of Nicaragua and Honorary Fellow of the International College of Surgeons. The Board of Trustees, officers and members of the College unite in expressing sincere condolences, not only to the bereaved family but to the Republic deprived of his fine leadership.

Surgical Management of Hydatid Cyst of the Lung

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Secretary, Spanish Chapter, International College of Surgeons
BARCELONA

THE incidence of hydatid cyst of the lung in Spain is not so large as in Greece, Argentina, Uruguay, Australia or New Zealand, but it is sufficient to provide some experience. Here the disease occurs more often in the liver than in the lung; yet in my clinic the frequency of pulmonary cyst is higher than that of hepatic cyst. This may be due to the fact that hepatic cysts are operated on in many clinics and that patients with pulmonary cysts come more often to specialized centers.

My purpose in this article is to present an operative technic that I have standardized: an operation in one stage, with free pleura or without, which in a series of more than 100 cases has resulted in no mortality and few complications.

The hydatid cyst represents a cycle in the life of *Taenia echinococcus*. This organism adopts different anatomopathologic characteristics according to its localization in the human body. One of the characteristics of hydatid cyst of the liver or of the lung is the formation of an adventitial membrane organized by either hepatic or pulmonary tissue with the growth of the parasite. This membrane, however, should not be considered a mere reaction of the tissue to the presence of a foreign body, for it also maintains a symbiotic process between the human being and the parasite. Through this adventitial membrane the parasite supplies its nutritional needs by imbibition. This applies to the parenchymatous organs (liver and lungs). In other sites—e.g., in the bones—the adventitial membrane does not exist, and the daughter vesicles invade the medullary cavity without any opposition from organic defense. Under these circumstances, hydatid cyst in the bone is highly malignant. In the lung, the cyst in its progressive growth rejects the pulmonary parenchyma, obeying the characteristics of this parenchyma (difference of density, bronchial induration) and being subject, in its growth, to the constant movement of the pulmonary parenchyma in the breathing process.

As long as this cyst is growing and is surrounded by the adventitial membrane, it is a cyst of the first degree, the complete living cyst. Very often, in its growth, it comes into contact with the bronchial tree or near it, and often, in a moment of effort or coughing perforates into the bronchi, breaking the adventitial membrane and even the hydatid membrane, and producing what is called hydatidopthisis: invasion of the hydatic liquid into the bronchial tree with coughing of a large quantity of liquid, preceded by some blood. Sometimes this hematic coughing makes the patient anxious, and he consults a surgeon because he thinks he has tuberculosis. Until this moment many patients show no clinical signs of disease.

When the cyst is near a large bronchus, the rigidity of the bronchial wall prevents formation of the adventitial membrane, and the bronchus is closed only by contact with the cystic membrane, which is very fragile. This facilitates perforation of the hydatid membrane and release of its liquid contents into the bronchial tree.

Under these circumstances, two things may happen: (1) the hydatid membrane and its fluid contents may be ejected through the bronchial tree and the patient completely healed as a result, or (2) the hydatid fluid alone may be ejected through the bronchial tree, the membrane being retained in the cavity. This is a more frequent occurrence, as the membrane is often too large to go through the bronchial tree. Under these circumstances a second type of cyst remains: the dead cyst, with retention of the membrane.

In some cases the efflux to the bronchial tree is very small, and when the patient coughs some air penetrates between the adventitial membrane and the hydatid membrane, altering the nutritional status of the parasite and causing its death. This condition is observed

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frequently in roentgenograms of hydatid cyst of the lung.

More often it happens that the hydatid membrane is retained after evacuation of all of the liquid cystic contents. The intracystic pressure relaxes and the atelectasia surrounding the adventitia disappears. The elastic pulmonary tissue enfolds the solid rests of the hydatid membrane. This represents dry retention of the membrane, or dry cyst, creating a new condition called the hydatid pyocyst (retention of the hydatid membrane with superadded infection). When such an infection is not well treated, it may be the cause of chronic purulent expectoration, with sputum similar to that associated with bronchiectasia.

Fundamentally the diagnosis of hydatid disease of the lung is roentgenologic, but one must observe the clinical and biologic signs as well. Even so, in many cases, the diagnosis is difficult.

The clinical signs are coughing, dyspnea, and fatigue. The initial symptom is the appearance of blood in the sputum. The patient and his physician both suspect some form of pulmonary tuberculosis. Often the patient goes to an antituberculosis center, and there, with the help of the roentgenologist, the true diagnosis is made.

I have observed many forms of silent evolution in which the cyst grew slowly to a large size without any clinical manifestations whatever. The roentgen picture of hydatid cyst is classic but not always easy to diagnose. Beclère described the cysts as round forms with sharply limited contours, looking as if drawn with compasses. This has been discredited; Escudero and Sergeant have said lately that no form so neatly rounded is a hydatid cyst of the lung. The roentgen diagnosis is confirmed by deformity of the cyst during respiratory movements. On deep inspiration it maintains its spherical form; on expiration it is always flattened and ovoid. This is due to its elasticity and its liquid consistency.

Some authors have observed buoyancy and oscillation of the cyst during respiration, the oscillations suggesting the movements of a buoy in the open sea.

When clinical phenomena have occurred in the neighborhood of the cyst, one can see in

Fig. 1.—*A*, anteroposterior view showing round mass on upper part of right lung. Peculiar irregularities were noted in lower anterior border of cyst. *B*, same patient after pneumothorax. Borders of mass still irregular; this was probably not a hydatid cyst but a pulmonary carcinoma.

A
B

Fig. 2 (same case).—*A*, specimen after pneumonectomy, showing neoplastic mass at different depths in pulmonary tissue. *B*, view of the bronchial tree seen through the tumor.

the roentgen picture the sign of Morquio, the pericystic pneumothorax. This is a small air insufflation, called by Devé "calotte aérienne."

The biologic signs are revealed by the Cassoni test (intradermal injection of one drop of hydatid liquid) which commonly gives a positive reaction in the sensitized carrier of hydatid disease. This test is very important when its results are positive, but in some cases, when the cyst is closed and surrounded by much tissue reaction, the results may be negative. Also, the test has given positive results in some cases in which no hydatid disease existed, and this proves that one must be careful not to overestimate its significance.

If eosinophilia is present to a large extent, it also is helpful in confirming the diagnosis, but, as is well known, eosinophilia sometimes coexists with other conditions as well.

The Weinberg reaction is routinely used, but its results are not entirely conclusive. Puncture of the hydatid cyst would be one of the best possible diagnostic methods, but this puncture should never be performed, because it is dangerous; it can even produce sudden death from allergic colloidoclassic shock. The diagnosis can also be sustained by careful roentgen examination under the control of the biologic and clinical signs.

In some casse the cyst must be differentiated from cancer of the lung, especially the metastatic forms of cancer, which produce round shadows on the pulmonary film. In some cases a diagnostic pneumothorax can be used, because this modifies the form of the tumor and permits a positive diagnosis.

Pulmonary abscess sometimes resembles the dry hydatid cyst associated with infection, but the clinical signs are different.

The surgeon dealing with hydatid disease of the lung must bear in mind that tuberculosis and abscess of the lung are destructive processes, whereas the hydatid cyst is a diastatic process which, in growing separates the pulmonary tissues.

For discussion of the diagnostic problem I present a personal case. The patient came to me with the diagnosis of hydatid disease of the right lung (Fig. 1*A*). The Cassoni reaction was positive; the leukocyte count revealed 8 per cent eosinophils. The only clinical sign was coughing. Bronchoscopic examination re-

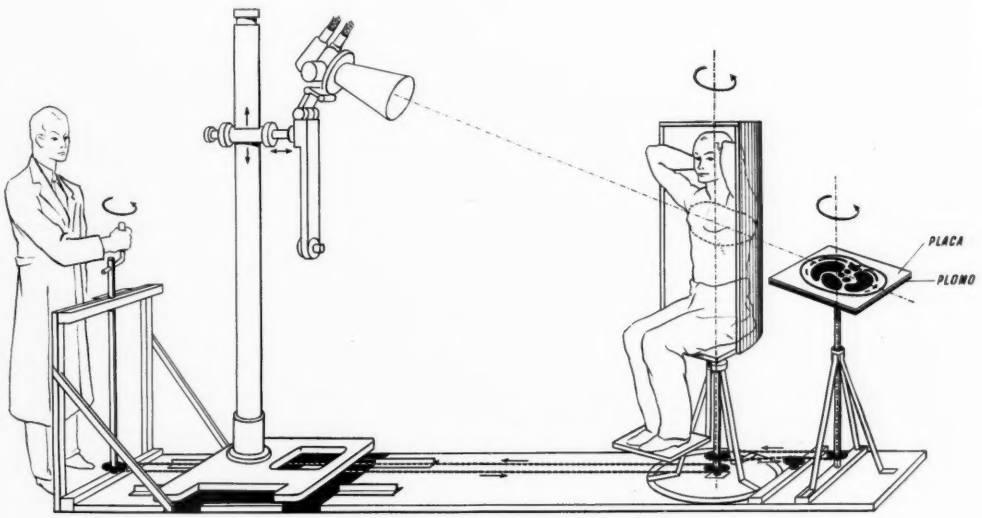

Fig. 3.—Roentgen apparatus described in text.

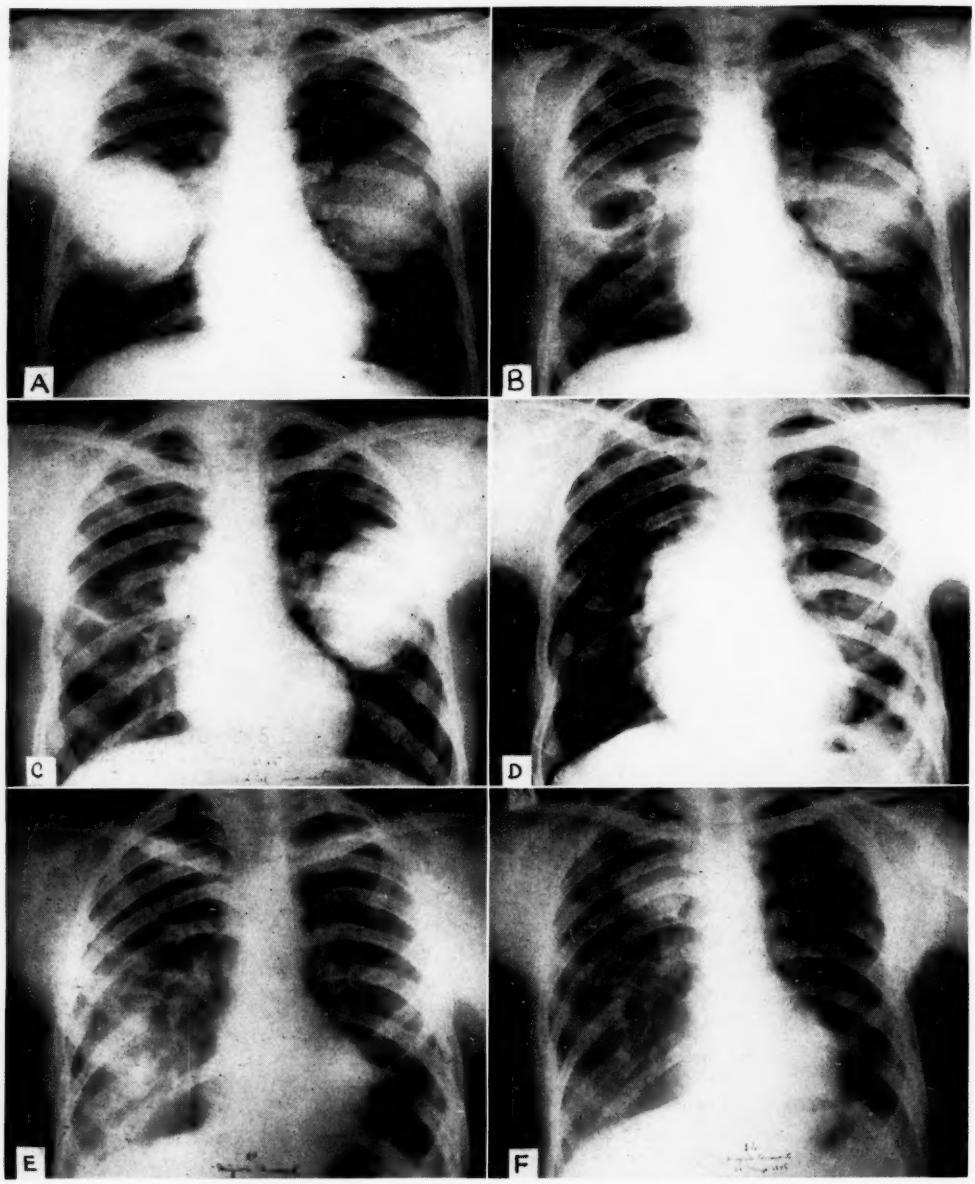

Fig. 4.—*A*, anteroposterior roentgenogram of patient with three distinct cysts, two in right lung and one in left. *B*, same patient after one-stage operation to extract both cysts from right lung. Small mass appears on right mediastinal border. *C*, healing of scars in right lung prior to operation on left. *D*, patient after healing of the three cysts. Note mediastinal growth showing presence of a fourth. *E*, patient after healing of all four cysts, with no indication of a fifth. *F*, fifth cyst appearing on upper lobe of right lung.

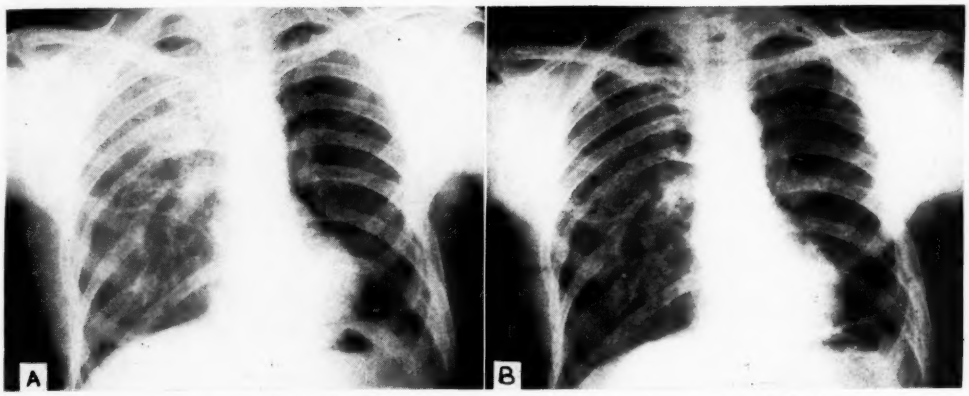

Fig. 5.—*A*, same patient after hydatidopthisis. Note retention of the membrane and fluid level. *B*, same patient after excision of fifth cyst. Film shows complete healing of pulmonary parenchyma.

vealed no abnormality. The roentgenogram showed a round mass with some irregularities on its borderline. An artificial pneumothorax confirmed the diagnosis of cancer (Fig. 1*B*). I performed a thoracotomy, which further confirmed the diagnosis, and I proceeded then to perform a total pneumonectomy (Fig. 2).

The creation of a pneumothorax is very useful in cases of neurinoma, because this type of tumor is sometimes round and may be mistaken for hydatid cyst, but it is always extrapulmonary and in contact only with the internal wall of the thorax. By producing a pneumothorax it is easy to confirm its position.

My collaborators, Dr. Modolell and Dr. Manchón, of the roentgenologic department in my hospital, have recently invented a new and amazingly ingenious procedure for localization of thoracic conditions This procedure permits the making of cross-section tomograms of the body, giving the third dimension (Fig. 3).

The patient sits on a revolving bench, connected to a table which revolves at the same speed, holding a flat roentgen plate. The revolutions of the patient enables us to obtain the cross-section film. Figures 1 and 2 are examples of these amazing roentgenograms. Fig. 2*B* shows the method of Modolell and Manchón.

This method is extremely useful for localization of all pulmonary conditions but can be used for any part of the body.

TREATMENT

The surgical treatment of hydatid cyst is still a matter of some disagreement in the different surgical schools. In the beginning the operation was a very delicate one, the risk was

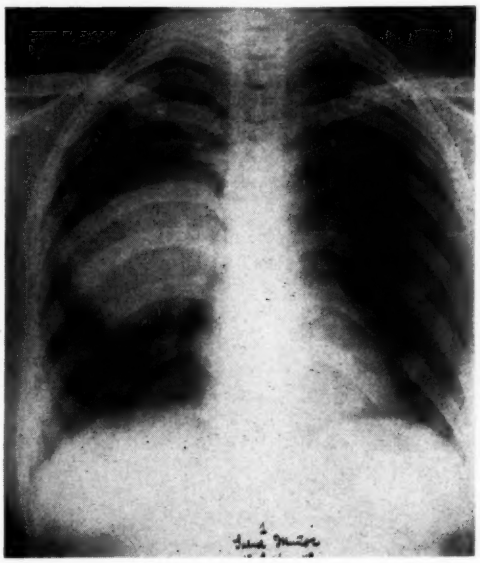

Fig. 6.—Anteroposterior roentgenogram of another patient with voluminous hydatid cyst of right lung.

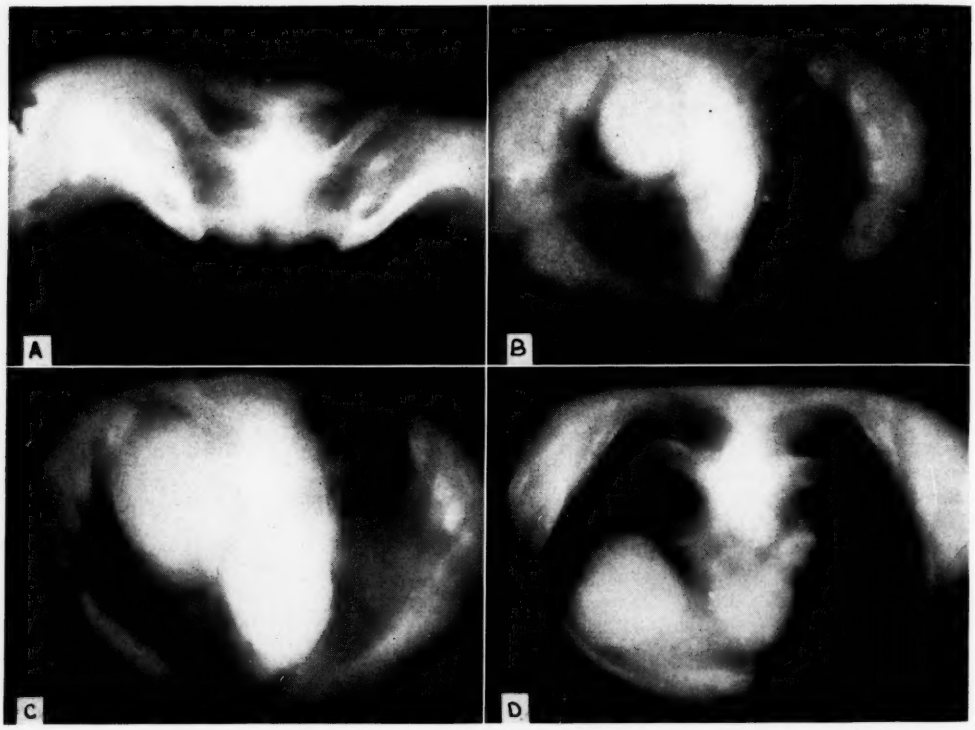

Fig. 7.—*A*, very high cross section at level of neck to show pulmonary apices, trachea, vertebral process, clavicles and first, second and third ribs. *B*, cross section at different level. *C* and *D*, cross sections showing posterior location of cyst near vertebra and heart.

great, the mortality high and the procedure always dramatic. These difficulties and dangers were the result of creating an operative pneumothorax in the presence of nonadhesive pleura. The routine treatment was marsupialization, and the constant complication was pleural infection. Bronchocutaneous fistula occurred frequently and persisted endlessly.

In order to avoid some of these inconveniences, Arce and Finochietto, of Argentina, suggested a preliminary pneumothorax. Lamas and Mondino were performing marsupialization when they observed pleural adhesions. In the presence of free pleura they suggested a two-stage operation, obtaining the pleural adhesions by leaving a swatch of iodoform gauze in contact with the pleura.

Posadas proposed employing a one-stage operation only in cases of living cyst without infection, suturing the lung without drainage. This method has been used by Makkas in Greece. Some surgeons, e.g., Allende and Langer, suture the bronchial tree after extracting the cyst. Recently, Taiana suggested cystectomy with section of the adventitial membrane and suture of the bronchi, but when the cyst is very large he suggests a pneumonectomy or a lobectomy.

I do not agree with this opinion, because I consider it necessary to be very conservative with lung tissue in cases of cyst. In order to prove my point, I present Figure 4. The patient here represented had three very large hydatid cysts (Fig. 4*A*). I operated in one stage, in a manner to be explained later, first on the right lung, extirpating two of the cysts (Fig. 4*B*) and then, when the scar of this operation was in good condition (Fig. 4*C*).

on the left lung, but I did not pay much attention to a little mass that appeared on the right mediastinal side of the right lung. When the cyst of the left lung was healed (Fig. 4*D*) another paramediastinal cyst was diagnosed and another one-stage operation performed (Fig. 4*E*). Some time later the patient returned with still another cyst, at a higher level, in the right lung (Fig. 4*F*). This cyst communicated with the bronchial tree, producing hydatidophthisis, but keeping the parasitic membrane inside it. A fluid level was visible in the film. I operated again in one stage, obtaining complete healing of this patient (Fig. 5). This case proves the necessity of being conservative. I could not accept the idea of performing so many lobectomies or segmentectomies on the same patient, and, in any case, lung tissue has an enormous capacity for recuperation. Figure 6 shows the patient in the anterior and posterior positions.

The cross-section roentgenogram (Fig. 7*A*) shows a very high cut; one can easily see the vertebral process, the clavicles, the trachea and the apex of the lung.

Figures 7*B* and 7*C* show the same patient at different levels, with posterior localization of a hydatid cyst of the lung.

TECHNIC

Intratracheal tube, pentothal-flaxidil or curare anesthesia is employed. I do not consider it too important whether the pleura is free or presents adhesions. I isolate the tissues surrounding the cyst with serum-wet gauze, keeping the cyst external as far as possible. I confirm the diagnosis by puncture; then I make an incision in the lung tissue in order to permit extraction of the hydatid membrane. The cystic cavity is aspirated and then explored with an electric light. I do not suture the bronchi inside the cavity. These bronchi are useful for draining the cavity through the natural channels to the bronchial tree. I perform a suture of the lung itself and control leakage by pumping the lung full of air. The

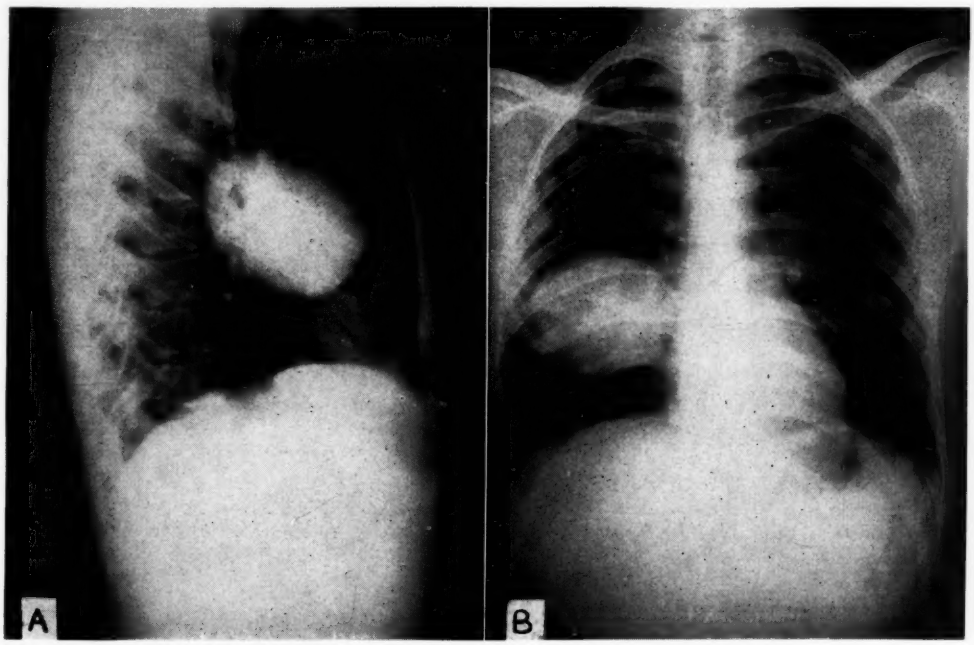

Fig. 8.—*A* and *B*, lateral and anteroposterior views of patient with hydatid cyst.

suture is attached to the walls of the thorax, and no drainage is employed. This technic is used not only for the living cyst but for the dry cyst containing only the membrane. Infection is produced only by retention of this membrane, and I clean the cavity with penicillin and consider the bronchial communications sufficient as drainage if any bronchi exist in the cavity, as is nearly always true. The only condition for which I employ drainage is pyocyst without bronchial communication.

The statistical records at the time of writing are fairly extensive and show constantly good results.

SUMMARY

The nature and treatment of hydatid cyst of the lung are discussed, with considerable stress on the need of caution and conservatism in the surgical handling of pulmonary tissue. The author's own technic is presented and explained. The results of its use in a considerable series of cases have been good.

RÉSUMÉ

La nature et la thérapeutique du kyste hydatide pulmonaire est étudié pesant fortement sur la nécessité d'agir avec prudence et conservatisme pendant la manipulation chirurgicale du tissu pulmonaire. La technique de l'auteur est présentée et expliquée. Les résultats de son emploi au cours d'une série importante de cas ont été satisfaisants.

RESUMEN

Se estudia la naturaleza y tratamiento del quiste hidatídico pulmonar destacando especialmente la necesidad de proceder con cautela y con un criterio conservador al intervenir quirúrgicamente los tejidos pulmonares. El autor presenta y explica su propia técnica. Los resultados obtenidos mediante la misma en un considerable número de casos han sido buenos.

RIASSUNTO

Discute la natura e la cura delle cisti idatidee del polmone, sottolineando la necessita' di molta prudenza e di spirito di conservazione nel maneggiare il tessuto polmonare. L'A. illustra la propria tecnica operativa, che ha condotto a buoni risultati in un numero notevole di casi.

Of Truth

Time, whose tooth gnaws away everything else, is powerless against truth.
—*Huxley*

Defeat is a school in which truth always grows strong.—*Beecher*

God offers to every mind the choice between truth and repose.—*Emerson*

Truth is such a precious article, let us economize it.—*Mark Twain*

Brown-Sequard Epilepsy Induced by Cutaneous Parasites

DR. ANDRÉ PLICHET*
Editor, *La Presse Medicale*
PARIS

IT IS well known that Brown-Sequard, by partial resection of the sciatic nerve in guinea pigs, induced a certain form of epilepsy. After some weeks the animals showed important modifications of sensibility in the area of the head and neck, on the side on which the sciatic nerve had been sectioned. Pinching in this zone produced no painful reaction but provoked clonus of the hindleg, a scratching reflex ending rapidly in a typical fit of epilepsy, with loss of consciousness and tonic and clonic convulsions.

The proportion of success in this experiment when performed by others is variable. Pagniez, Koang and I have shown that epilepsy is more easily obtained by disarticulation of the corresponding hindleg than by resection of the sciatic nerve.

This form of epilepsy has two characteristics that make it interesting for study; on the one hand, these fits are somewhat similar to those of human epilepsy, and on the other hand, the epileptic guinea pig is afflicted, like man himself, with a real and lasting disease. Like the human epileptic patient, the animal becomes a "convulsionnaire" in display, with the peculiar characteristic that a paroxysm can be provoked at will.

The cause of this epilepsy has not been clear. Brown-Sequard considered it a form of ascending degeneration consequent upon resection of the sciatic nerve, but the fact that my associates and I obtained it in a very short time by aseptic amputation of the hindleg (which excluded also the possibility of a traumatic neuroma of the sciatic nerve) prevents us from accepting this idea.

Dr. Pagniez, Dr. Laplane and I (*Presse Medicale* Oct 6, 1934) have demonstrated that this epilepsy is intimately connected with the multiplication of lice in a zone where the animal cannot scratch itself because of resection of the sciatic nerve or amputation of the hindleg.

This multiplication of the lice did not escape the attention of Brown-Sequard, but he noted it merely as a curious accessory incident. It is obvious that in the epileptic guinea pig the fur in the epileptogenic zone is infested with many more lice than is the fur elsewhere on the body. The explanation of this fact is simple: first, the epileptic guinea pig has lost the sensation of pain in the epileptogenic zone, and, second, it is not able to scratch the area with its hindleg; therefore, the lice are undisturbed and multiply rapidly.

To establish proof of the part played by the lice, we destroyed all parasites in the epileptogenic zone with xylol (and later with DDT) or by shaving the fur. When this had been done, pinching the epileptogenic zone induced the convulsive fits only rarely and with great difficulty, and the next day no fit could be induced at all. The animal recovered the sensation of pain and squeaked when pinched in this zone exactly as when pinched elsewhere. All was again normal. After some weeks, however, the lice reappeared in the area that had been shaved or disinfected. This area once more lost all sensibility to pinching, and a fit could be induced just as before.

On a second guinea pig we were able to perform a still more conclusive experiment by *reducing* the epileptogenic zone. In the middle of the zone we shaved an area 1 cm. wide. On the following day we noted that pinching in this shaven area made the animal squeak, but that the same pinching in areas immediately adjoining it, still covered with fur and lice, provoked clonus of the stump and a generalized epileptic fit.

It is therefore certain that Brown-Sequard epilepsy in the guinea pig is intimately related to the presence of a great number of lice in the epileptogenic zone. Under these conditions it is unnecessary to resect the sciatic

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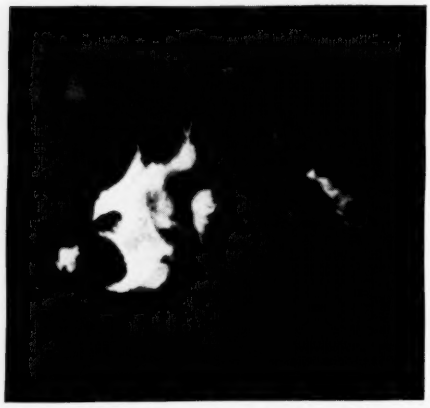

Fig. 1.—Clonic phase. The animal has fallen on its back, with its head turned to one side, its mouth open and its paws convulsed.

nerve or to amputate the hindleg. Merely by preventing the guinea pig from scratching itself in a certain place it is possible to create an epileptogenic zone due to the increased local infestation by lice. One can fasten the hindleg of the guinea pig or wrap it in a bit of cloth or rubber, and after a certain time one can produce an epileptogenic zone and fits of epilepsy.

What is the action of the lice? Those that

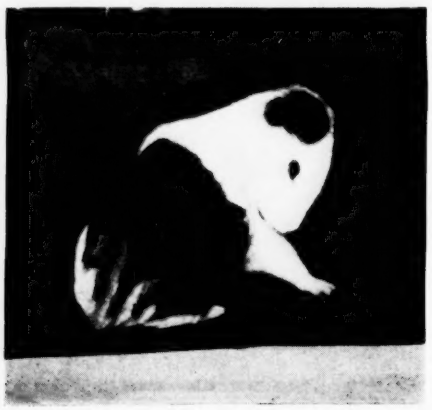

Fig. 2.—Interparoxysmal phase. The animal is still unconscious; its head is strongly bent and its forelegs stretched. It is about to fall again, with total loss of consciousness.

developed on our guinea pigs were of a special species, from the family of the mallophages: *Gyropus ovalis, gyropus gracilis* and *Menopon extraneum*. These lice are not pricking insects, and no red globuli could be found in their digestive organs. One might imagine that they put into the skin an irritative substance acting directly or by a process of sensitization, but this hypothesis also seems false. We crushed a great number of mallophages and put the mixture under the skin of a new guinea pig hypodermically or by scarification; no epileptogenic zone developed. We devised a small instrument for superficial and repeated pricking, provoking a constant and prolonged irritation of the skin at the same place, but this also failed to create an epileptogenic zone.

It is possible that the lice act merely by their presence and by frequency of contact with the nervous extremities, the nerve losing its normal sensibility and acquiring a new character. Perhaps they take away, by sucking, a certain quantity of the secretions of the cutaneous glands or of certain normal elements of the skin, which loses its natural quality as a result.

These are questions to which we still have no answer. What we can say is that a very large number of lice is necessary to create an epileptogenic zone. The severity of the fits seems to be in proportion to the number of parasites, and this fact explains the different results obtained by various experimenters. Some have had 90 per cent success and others only 15 per cent.

My friend Dr. W. Liberson (of Hartford), who observed my experiments when he was in France, had great difficulty in developing epileptic guinea pigs in Canada, where he worked for a certain time. This suggests that the animals in the laboratories of the New World are cleaner than those in old Europe; they have fewer lice. Or was it perhaps due to the season? During a very cold winter we were surprised to see that guinea pigs which had been operated on did not become epileptic, but in the spring, some weeks later, all of them had fits. At the beginning of our experiments, when we did not know the part played by the lice, we had thought it an anomaly due to the diet.

We know now, however, that if the guinea pigs had no fits in the winter it was because

the mallophages had not become numerous enough during the cold weather.

COMMENT

The experiments described in this article, which we performed for therapeutic ends, brought us to the conclusion that Brown-Sequard epilepsy in the guinea pig is closely related to the multiplication of certain species of lice in a certain zone. The nervous lesion formerly considered essential is in reality an accessory condition. Resection of the sciatic nerve is effective only because it prevents the animal from scratching a zone that it cannot touch with its teeth or its other paws.

It has been said that Brown-Sequard epilepsy is epilepsy due to a reflex but having a substratum of neuropathologic change. It appears now, on the contrary, that it is an epilepsy without a nervous lesion, at least without a lasting one. It disappears with the parasites that cause it. But it is an epilepsy with a cutaneous starting point, which demonstrates the importance of peripheral irritation as an epileptogenic agent. This is the first experimental demonstration of the possibility of convulsive manifestations due to a parasitic agent.

Are there other animals in which epileptic fits can be obtained by the same method? We tried many times on the rabbit, with amputation of the hindleg, but we could never create an epileptogenic zone. We were more successful with white rats and white mice, but the fits were not half so striking as those of the guinea pigs. Perhaps the rats and mice were not infested by the proper parasites. Dogs may have spontaneous fits of epilepsy, which in France are due to an acarid living in the ears of the dogs. If one kills all the acarids by a special treatment, the fits disappear also.

We have never observed fits of this kind either in children or in adult man, but the experimental facts just recorded suggest that perhaps epilepsy due to parasites is more frequent than has been suspected.

RÉSUMÉ

L'auteur mentionne des cas d'épilepsie du type Brown-Séquard se produisant chez le cobaye fortement infesté par certaines espèces de poux. Il relève que l'épilepsie due à l'irritation cutanée par certains parasites peut aussi se produire chez l'homme.

RESUMEN

El autor comunica una epilepsia del tipo de Brown-Sequard que se presenta en los animales de experimentación (cobayos) intensamente infectados con piojos de ciertas especies. Se indica que la epilepsia por irritación cutánea causada por los parásitos puede también presentarse en el hombre.

RIASSUNTO

Descrive una forma di epilessia tipo Brown-Sequard che ricorre in animali da esperimento (cavie) infestati da talune specie di pidocchi. Non e' da escludersi che anche nel-l'uomo l'epilessia possa insorgere da irritazioni cutanee di origine parassitaria.

Austrian Assembly, 1950

The Annual Assembly of the Austrian Chapter, International College of Surgeons, will be held in Vienna on June 30 and July 1, 1950. For complete information please write to Prof. Dr. Felix Mandl, Ferstelgasse 6, Vienna IX, Austria.

Total Sterilization of Operating Room by Antibiotic Aerosol

PROF. DR. A. M. DOGLIOTTI, F.I.C.S.
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TURIN, ITALY

AN OPERATING room completely sterilized by antibiotics was first employed in the Surgical Clinic of Turin in October, 1949. My associates and I believe it to be an absolute and promising novelty and one that may mark the starting point of substantial progress in the organization of the operating rooms of hospitals and clinics in the future.

So far as we know it is the first of its kind, and we are sure that, like all innovations in the surgical field that offer greater safety to suffering humanity, it will become an object of interest and study. Surgeons today feel an obligation not to neglect any method that may reduce the danger of surgery and the hazards of its most dreaded complications.

Before explaining the criteria adopted in construction of this operating room, I wish to recapitulate briefly some considerations leading to the experiment.

Our aim was to obtain sterilization of the room itself by means of penicillin aerosol. We all know the importance of asepsis in the operating room, but in spite of great progress in the construction and organization of operating rooms in modern hospitals, a certain number of infections still occur, depending on the surroundings in which the operation is performed. This happens especially when several patients are operated on one after another in the same room, but it happens also in the course of a long-lasting single operation.

What surgeon, indeed, does not even now encounter some infections of greater or less degree, or some secondary complication of the infectious type—phlebitis, pyelocystitis, pleuropulmonary foci, etc.—of which it is logically believed that introduction of the pathogen occurred during the surgical procedure?

Only by multiplying precautions to render our methods of sterilization thorough and complete and by keeping away from the operating field all potential factors of infection can we reduce the danger of infection to a minimum. By no method thus far devised has it been possible to exclude all risk.

Attempts to obtain total disinfection of the surroundings were made many a time in the past. We all remember Lister's historic attempt, in which he sprayed the surroundings with carbolic acid. Many others, after Lister, tried disinfection by pulverization and evaporation of antiseptics; but these methods found no practical application because of the harmful effects of the substances used, either on the patients or on the surgical staff.

In the most up-to-date and perfectly maintained operating room, the possibility of contamination by air-borne pathogens remains, even though the air is conditioned and filtered and the operative surroundings are sterilized by prolonged preoperative ultraviolet irradiation. This fact is demonstrated by a simple experiment, which consists of exposing, for the whole duration of the operative procedure, some agar-agar plates. On these plates a varying quantity of various organisms can be detected (the variation depending on the given environmental conditions), some of which are pathogenic to man. By means of this simple experiment we have been able to demonstrate repeatedly the impossibility of complete asepsis by common methods of sterilization of the operating rooms.

Now, however, we believe it is possible to avoid this persistent danger by applying the method we are introducing. We have confirmed its efficiency by actual trial.

Our plan was realized by building, inside one of the large operating rooms in the Surgical Clinic of Turin, a smaller room (but sufficiently large for all the necessities of major surgical procedures) entirely constructed of glass and duraluminum; practically airtight,

From the General Surgical Clinic, University of Turin, Prof. Dr. A. M. Dogliotti, Director.

Fig. 1.—Operating room seen from students' gallery.

in which the operating table, the surgical staff, the anesthetists, the auxiliary anesthetists, the service staff, the instrument table, the anesthesia apparatus and Guassardo's pilot control for automatic regulation of the aerosol fog are comfortably accommodated. The operating room is sterilized during the night by means of special bactericidal ultraviolet lamps. Shortly before the operation commences, penicillin aerosol is introduced by means of a series of 8 "nozzles" placed in the corners of the operating room itself. These "nozzles" are supplied with a tube carrying filtered compressed air, appropriately conditioned for temperature and humidity. The air compressor, the filters and the air-conditioning apparatus are all arranged on the upper floor. The density of the aerosol fog in the operating room is automatically controlled by the photoelectric cell contained in Guassardo's pilot apparatus. The filtered and conditioned air inlet can work independently of aerosol in order to assure an adequate supply of oxygen to the room.

When the surgeon operates under these conditions, he can rely on simultaneous and continuous action of the penicillin contained in the atmosphere in the form of tiny drops which fall on the wound, the exposed viscera and the body tissues. For operations in the thorax (which may last several hours), in the cranium and in the abdomen (in which viscera are amply exposed) the air containing the antibiotic substance will penetrate everywhere, keeping the remotest nooks in the operative field under its action. On the other hand, there is a continuous penetration of penicillin through the patient's windpipe and bronchopulmonary system, and also in the blood stream, with a presumably preventive action against postoperative pulmonary complications.

We are now trying to determine the quantity of penicillin that goes into the blood through the alveolar surface and, therefore,

in addition to being active on the spot, is also active in the blood stream.

The antibiotic fog acts upon the entire operating room, as well as upon the operative field and the patient. It deposits a microscopic antibiotic sediment on all exposed matter; on the surgeon's hands, on the table, on the instruments, on the catgut and silk, the gauze, the sterilized towels; in short, on everything that comes sooner or later into contact with the wound. Organisms projected into the atmosphere by the surgeon, by the patient or by the operative personnel in speaking or moving about are suppressed by the thick fog made up of innumerable microscopic drops of antibiotic aerosol.

These are the favorable factors on which we rely in presenting our new antibiotic operating room. Several colleagues have already formulated objections, which I must answer immediately. Can the persons working in the operating room—surgeons, anesthetists, nurses and others—be harmed by living and breathing for hours in an atmosphere of penicillin aerosol fog? Above all, is there danger of getting accustomed to the antibiotic or developing a resistance to it, such as would make its use ineffective in case of need?

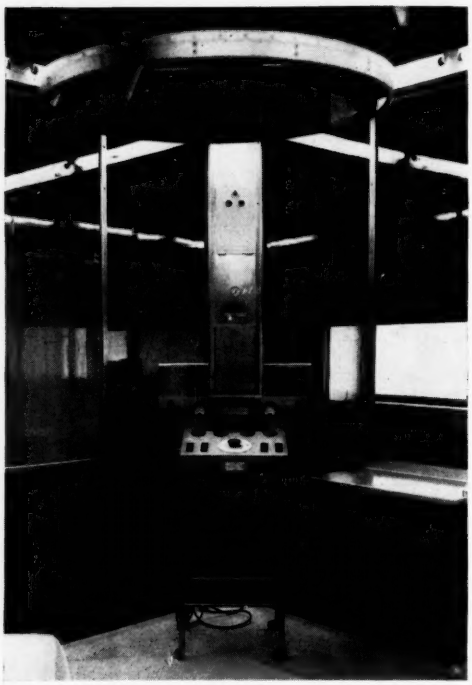

Fig. 2.—Corner of antibiotic operating room with apparatus for automatic photoelectric regulation of aerosol fog.

Fig. 3.—Another corner, showing column with 2 nozzles (above), various lights, including ultraviolet, and aerosol control buttons (central part). Shorter column on floor is for oxygen, anesthetic gases, diathermy, endoscopic studies, etc.

We believe that there is not the least cause for worry in this respect, because the eventual maximum tolerance acquired does not represent a disadvantage. Resistance to penicillin by pathogenic organisms, it is true, would be important. But these organisms change constantly, and we do not believe that any such resistance can occur in our operating room, in which bactericidal ultraviolet rays are at work when the surgeon is not operating and will destroy all penicillin-resistant germs. We therefore believe that from a biologic point of view there is no danger to the operating staff.

Further communications will be made after longer trials and additional experimental work.

A second objection deals with working costs. Our first experience permits us to affirm that with 2,000,000 oxygen units we can keep our operating room supplied with sufficient penicillin to guarantee absolute asepsis and antisepsis for three to four hours, a sufficient length of time to perform even the longest operations. We believe that the expense is fully justified if it produces, for the first time in the history of surgery, an operating room in which total sterilization of the air and all contents is achieved, for it gives the patient the certainty of escaping infection and the surgeon a final victory over one of the greatest obstacles to the triumphant advance of his art.

SUMMARY

A new method of total sterilization of an operating room by means of antibiotic (penicillin) aerosol is introduced. The method is already in operation at the Surgical Clinic of Turin and gives every evidence of success. Its use was begun in October 1949. The author proposes to study the method further, with careful checking of the proved results, after which further publications will evaluate the experiment.

RÉSUMÉ

Une nouvelle méthode de stérilisation totale de la salle d'opération par l'antibiotique aérosol (pénicilline) est décrite. Cette méthode est déjà en usage dans la Clinique Chirurgicale de Turin et parait être couronnée de succès. Elle a été utilisée des Octobre 1949. L'auteur étudie les résultats de cette méthode d'une façon plus poussée en notant soigneusement les résultats patents après quoi de nouveaux articles nous feront connaître la valeur de cette méthode.

RESUMEN

Se ha desarrollado un nuevo método para la esterilización total del quirófano mediante el aerosol de un antibiótico (penicilina). El método se está practicando en la clínica quirúrgica de Turin con manifiestas pruebas de éxito, habiéndose comenzado su empleo en Octubre de 1949. El autor se propone continuar estudiando este método, comprobando cuidadosamente los resultados obtenidos, tras o cual otras publicaciones evaluarán el experimento.

RIASSUNTO

Propone un nuovo metodo di sterilizzazione della sala operatoria mediante aerosol-penicillina. Il metodo e' gia' in funzione nella Clinica Chirurgica di Torino e sembra destinato ad un completo successo. L'A. si augura che il metodo venga studiato ulteriormente, con un controllo accurato dei risultati. Successive pubblicazioni potranno definitivamente stabilire l'efficacia di questo metodo, ancora nella fase sperimentale.

Homo Sapiens

Man is the only animal that laughs and weeps; for he is the only animal that is struck with the difference between what things are and what they ought to be.
—*Hazlitt*

Man is the only animal that converses; therefore we know that he is Nature's masterpiece. He says so himself.—*Gavarni*

Man is the only animal that blushes. Or needs to.—*Mark Twain*

Duodenal Obstruction

JOHN HERTZ, M.D., D.Sc., F.I.C.S.
COPENHAGEN

THE TERM "duodenal obstruction" covers as many different conditions as does the term "intestinal obstruction." Clinically, however, the condition presents characteristic features, and, as the literature contains only a limited number of reported cases, a small series from the Karolinska Sjukhuset in Stockholm may be of interest.

Etiology and Pathogenesis.—The cause of duodenal obstruction may be found inside the lumen, in the wall, or entirely outside the organ. Congenital as well as acquired disease may be responsible. According to its relation to the ampulla of Vater, the stenosis may further be divided into (a) suprapapillary and (b) infrapapillary stenosis.

Congenital intraluminal stenosis is most frequently due to atresia, which may be attributed to the embryonal occlusion described by Tandler. This atresia may be of any degree, from a simple mucous diaphragm, complete or incomplete (Brattstrom) through a stage in which two culs de sac are connected with a band (Mohrman) to complete disappearance of a segment, with two complete, independent culs de sac. These forms of intestinal atresia, which have been thoroughly studied by the Swedish surgeon Forssner, are most frequently located in the duodenum, as was pointed out first by James Calder in 1753 and later by Boernerus in 1754 and Boyd in 1845. Davies and Poynter's statistics include 392 cases of intestinal atresia, in 134 of which the condition was duodenal, in 59 suprapapillary and in 75 infrapapillary. For children the incidence is estimated at 1 in 20,000 (Benson and Grover). Intraluminal stenosis may further be caused by an intrauterine ulcer with obliteration of the lumen (Dahl Iversen).

Congenital stenosis may also depend upon lesions outside the duodenum proper, in most cases disturbances of intestinal rotation, consisting either in incomplete fixation of the cecum and the ascending colon (Bloodgood; Donovan; Donovan and McIntosh; Wilkie) or incomplete descent of the cecum, which is being fixed to the duodenum by a band (Dahl Iversen; Donovan; Vilette). A compression of the duodenojejunal junction may arise from abnormal intestinal mobility; e.g., a common ileocolic mesentery (Ehrenpreis; Janker) with a disposition toward volvulus, the proximal end of which is most frequently situated at Treitz' ligament (Dahl Iversen; Janker). The pathogenic significance of incomplete descent of the cecum or of fetal peritonitis is completely denied by Tandler; it must, however, be admitted that this pathogenesis is well established in several cases reported in the literature. An abnormal fixation of the duodenojejunal flexure as a result of abnormalities at Treitz' ligament may likewise give rise to stenosis (Nordentoft); Hellström has reported a case of this kind in which an abnormally fixed fold of the peritoneum has given the flexure a more pointed form than is normal. In Morlock and Gray's peculiar case the deficient intestinal rotation was complicated by a hernia extruding through an opening in the mesentery corresponding to the lower portion of the ileum. In addition to the etiologic factors already mentioned, compression may be due to fetal peritonitis with formation of adhesions (Stenson; Webb and Wangensteen), also to pressure produced by congenital tumor or cyst or by an open annular pancreas. In 1 of Webb and Wangensteen's patients the proximal and distal segments were divided by an annular pancreas, and in another case a stricture was present below the papilla of Vater; the head of the pancreas enveloped the duodenum at the point of obstruction.

An intermediate form of acquired obstruction is arteriomesenteric compression, the cause of which lies in the anatomic conditions at the origin of the superior mesenteric artery, where it rides across the inferior horizontal part of the duodenum. Numerous other factors, congenital as well as acquired, are significant in this connection. The congenital conditions associated with predisposition include

From the Karolinska Sjukhuset, Surgical Department, Prof. John Hellström, M.D., Chief.

the asthenic habitus, a short mesentery, a long ptotic transverse colon, nephroptosis, pronounced lordosis, or even the erect posture of man. Acquired factors include: lack of fat in the mesentery or poor tone of the abdominal wall, as in multiparae. By arteriomesenteric compression is understood a compression of the duodenum produced by pressure between the spinal column and the aorta on the one side and the root of the mesentery, containing the superior mesenteric artery, on the other. It must be remembered that the duodenum normally is slightly compressed and narrowed under the root of the mesentery, and hence a tendency to obstruction will result if the lumen is further diminished. This mechanism of arteriomesenteric compression was first described by Rokitansky in 1842; a number of investigators, among them Kostlivy and Melchior, have nevertheless denied its very existence and relegated it to history on the basis of the fact (*a*) that in certain instances the dilatation may continue beyond the duodenojejunal flexure and (*b*) that no mechanical causative factor can be established. It must, on the other hand, be emphasized that so many well established cases of true arteriomesenteric compression have been reported that this position can hardly be maintained. At postmortem examination, in which the diagnosis may be very difficult to establish (von Haberer), it has been possible to demonstrate a clear furrow in the duodenum under the mesenteric root (Blanc-Perducet); and in some instances operation has revealed a sharp demarcation between the dilated and the nondilated area of the intestine (Campbell; Lidström; Vilette). The significance of downward traction of the viscera is stressed by a number of authors (Aschoff; Horsley; Hurst; Miller and Gage; Rosenthal; Wilkie), who even consider this traction a *sine qua non* for the development of the condition; on the other hand, at least 1 case has been reported (by Lidström) in which the dorsal position of the patient seemed directly responsible for the symptoms. Probably this is true also of cases in which the condition has arisen after pneumonia, typhoid or some other disease involving prolonged bed rest of debilitated or emaciated patients (Beck). Leriche mentions aerophagy as a pathogenic factor; this causes a slow gastroduodenal distention, which may give rise to sudden arteriomesenteric compression. There is no doubt that other factors of no slight importance exist: viz., nervous reflexes from the stomach and the duodenum, with lack of coordination between the sympathetic and parasympathetic systems. Impulses from the peripheral branches of the splanchnic and vagus nerves may give rise to dilatation of the stomach and contraction of the sphincteric muscles of the vardia and pylorus (Hunter-Royle). This lack of coordination is supposed to account not only for acute dilatation of the stomach but for other conditions, such as Hirschprung's disease, cardiospasm, and probably even megaduodenum. Operation—in which chloroform or ether narcosis must further reduce the tonus of the stomach—may involve stimulation of sensitive visceral or somatic nerves and cause dilatation of the stomach, which may further, by pressure on the mesenteric vessels, cause arteriomesenteric compression (Devine; Dragstedt; Dragstedt, Montgomery, Ellis and Matthews; Gillespie). In this way quite a number of cases, though not all, may be explained.

Acute dilatation of the stomach may even arise as a result of operations on the limbs; in 97 such cases Laffer observed it in 60 patients after laparotomy and in 11 after operations on the limbs.

Among acquired intraluminal causes of duodenal obstruction, mention should be made of gallstones which have perforated to the duodenum and subsequently become impacted either in the superior part or at the duodenojejunal flexure, producing total or partial obstruction there. Apart from the natural channel, the choledochus, calculi most frequently leave the bile ducts by perforation to the duodenum or (less frequently) to the colon, or other organs. The relative frequency of perforation to the duodenum was suggested as early as 1877, in Murchison's classic report, which states: "Fistulae into the duodenum are not very uncommon." The same will be learned from any statistical account dealing with these diseases (Courvoisier and Naunyn; Gregersen; Judd and Burden; Paul Moller; Roth; Schroeder and Sloth; Wakefield; Vickers and Walters). One of the cases reported in the literature (Scofield) presented features of special interest, it was impossible to demonstrate the presence of any fistula or scar left

by a fistula, between the bile ducts and the duodenum; it must therefore be presumed that the gallstones obstructing the duodenal lumen had passed through the choledochus in this case. In other instances the pathogenic feature claimed to be inflammatory hyperplasia of the pylorus, as the calculi were not in themselves large enough to obstruct the lumen (Hale White). It should be mentioned also that tumors may cause obstructions of the duodenum as well as of other parts of the intestine (Herz; Hart; Hansen; Netousak).

Acquired extraluminal stenosis may arise as a result of periduodenal or pericholecystitic adhesions that make a kink in upon the duodenum or compress it. Many authors have described this mechanism (Alex; Bircher; Cotte; Fleiner; Hochhaus; Kehr, Müller; Ollendorf; Papin; Villard; Wegele) after encountering the adhesions in their own cases. Duval has described a syndrome, "la périduodénite essentielle sténosante," in which periduodenal adhesions, the cause of which cannot be demonstrated, give rise to more or less severe stenosis of the duodenum (Duval and Roux; Duval and Gatellier); here, as in the case of adhesions elsewhere in the peritoneum, one is probably faced with local peritonitis causing more or less pronounced adhesions. Whether the condition may be established as an independent entity, is perhaps doubtful, and in order to arrive at this diagnosis all other possible causes factor have, in any case, to be exclude with certainty.

The duodenum may also be compressed by glandular tumors, ("flexure lymphome") due to a simple inflammatory process as in appendicitis (Duval and Roux; Okinezye; Wantoch). This is not a particularly exceptional occurrence (Lardennois). The compression may also be caused by tuberculosis (Basabe; Janker; Kostlivy; Penich; Rowlands; Vilette; Wantoch), or by a tumor that has metastasized, as in Eichmeyer's case, in which the primary tumor was an ovarian cancer, or in the Petrén's case, in which cancer of the colon was the primary lesion. Retroperitoneal tumors, hepatic tumors and hepatic cysts may likewise produce compression, with consequent obstruction of the lumen.

In some cases it has been impossible to ascribe the condition to any particular cause, for which reason purely functional, kinetic neuromuscular disturbances of duodenal mobility have been held responsible (Brattström; Gillespie; Kostlivy; Nordentoft; Petrén). These disturbances may range from the slightest to the most severe degree.

A statistical account of the distribution of the causative factors among Danish patients has been published by Dahl Iversen, who found that in 14 of 24 cases of congenital stenosis the condition was caused by malformation of the intestine itself, and in 10 by external lesions.

If infrapapillary stenosis persists for any length of time the duodenum will be dilated and possibly become hypertrophic above the stenotic focus, thus forming a megaduodenum.

SYMPTOMS

Only a few cases of gallstones acting directly as the cause of duodenal obstruction have been reported in the literature. Those which I have been able to trace are briefly recapitulated in Tables 1, 2 and 3.*

The symptoms of duodenal obstruction may be acute or chronic; in adults the condition is most frequently chronic, with an insidious onset or an undiscovered preliminary stage; the lesion may also start as a chronic obstruction which later changes its character and becomes acute (Kraas and Beck). The history often indicates the origin; i.e., a long history of disease of the gallbladder or gastric ulcer may afford guidance.

The enormous tolerance of the duodenum to distention is to a certain extent responsible for the diversified character of the symptoms; e.g., a calculus may distend this organ considerably without giving rise to pronounced symptoms (Broeq, Brodin and Aime); this must be presumed to have happened in 1 of the cases here reported (Case 1).* Actual symptoms of obstruction may also be completely absent despite an apparently considerable occlusion (Dufour; Scofield; Wakefield; Vickers and Walters).

If the lesion occurs in a newborn infant, the clinical picture will be dominated by vomiting, constipation and reduced output of urine (Dahl Iversen), to which must be added dehydration (Benson and Grover-Lee); vomiting sets in about five days after birth. The

*Tables and illustrated case reports included in Dr. Hertz' article will appear in June issue.

child will become emaciated and will die quickly of emaciation and dehydration if treatment is not instituted.

If the condition occurs in an adult, another triad of symptoms—pain, vomiting and emaciation—will dominate the clinical picture. The presence of pain is, however, indicated with a striking difference. Some patients have practically no pain; others mention slight sensations and rumblings in the epigastrium; still others have suffered from intense intermittent pain, even to the extent of collapse. This type of pain strongly resembles that associated with perforation, being distinguishable from it only by the subsequent course (no peritonitis sets in). With acute dilation of the stomach the pain is likewise extremely intense. Some degree of epigastric discomfort is present in the great majority of cases. In 3 cases reported in the literature (Fiedler; Minta; Schüle) in which perforating gallstones had caused duodenal obstruction, the patients were cured without surgical intervention, and the heavy attacks of pain have been interpreted as a result of the perforation itself. This interpretation was confirmed by the occurrence of hemorrhagic vomiting some time later. The patients here to be reported on all suffered from pain, moderate in most cases, intense in only 1 (Case 4). Two of the cases (1 and 4) were peculiar in that the pain changed character, in Case 1 from a slight feeling of pressure to a more intense pain in the right side of the back, and in Case 4 from typically biliary colic to pains occurring som time after meals and relieved by genucubital position. In Case 2 the pain, which occurred intermittently, was more intense but should perhaps be ascribed to the ulcer.

The statements of patients concerning vomiting differ widely, though vomiting is a frequent and fairly constant symptom. It ranges from 0 (Cases 2, 3 and 7) with slight nausea, occasional eructations and vomiting (as in Case 1) to persistent copious vomiting such as accompanies acute dilatation of the stomach. The vomitus may contain bile if the stenosis is infrapapillary; if suprapapillary stenosis is present it is free from bile.

Feces and flatus are unaffected by many of the chronic obstructions. Constipation may set in (Cases 2 and 7) as in the 3 aforementioned cases from the literature of perforating gallstones that healed without operation. Diarrhea may alternate with constipation, or it may occur alone. The megaduodenum may cause a great deal of flatulence depending upon the degree of aerophagy, which is most frequently present in this lesion. It has been mentioned that the patients often suffer from headache (Gillespie; Petrén; Schmieden); indeed, this is such a prominent symptom that the French surgeons, e.g., Vilette, have actually spoken of "migraine duodénale" (Gillespie). This hemicranalgia is a symptom favoring the theories of the nervous origin of megaduodenum.

The absence of abdominal distention is a characteristic feature. In some cases there may be distention of the upper part of the abdomen, most frequently on the right (Cases 7 and 8). In 1 case (Case 9) distention occurred on the left. Even in newborn children this dilation of the right upper quadrant may be striking (Ladd; Lee), and peristalsis may be visible in the epigastrium (Benson and Grover). Acute dilatation of the stomach involves distention of the epigastrium, which may later spread to the whole abdomen. In a few instances in which the obstruction has been caused by gallstones (Fiedler; Fleishhauer; Friedmann; Gollinger; Monrofit; Tupper) an intumescence has been palpable at the site of the gallbladder (Case 1); this intumescence disappeared later in some instances. There is often some tenderness of the epigastrium.

If the condition has persisted for any length of time the most constant symptom is emaciation; in practically all cases reported in the literature the patient was emaciated, often to an extreme degree; in the case reported by Hellström the weight had declined to 35 Kg. Emaciation was also striking in some of my own series (Cases 1, 5, 6 and 7). A remarkably low blood pressure has been mentioned by Vilette as a typical symptom.

It is typical of arteriomesenteric compression that the symptoms, especially pain, may disappear when the patient is in the lateral or genucubital position, or by means of pressure backward, upward and to the left on the abdomen above the umbilicus, a maneuver which, according to Kellogg and Kellogg, "unlocks the duodenojejunal kink." This was

lucidly demonstrated in Cases 4 and 5. Elevation of the foot of the bed also appears to be of some value, as was stated by Beck. Some authors (Hurst-Hurst; Briggs; Rowland; Jones and Ryle) have found the symptoms most pronounced when the patient is in the erect position, whereas Lidström's case—in which the patient was suffering from a fractured crus—seems to show that the symptoms may be elicited simply by placing in the dorsal position a patient who had not previously shown any symptoms of gastric disease. In most cases a ventral position will give considerable relief (Rosenthal; Vilette; Wilkie).

Icterus does not belong to the syndrome proper, but it may occur if the occluding factor also involves the bile ducts (Case 7).

One of the patients of the American surgeon Lee presented thoracic symptoms referable to pressure from the dilated duodenum and stomach.

A symptom of great significance, to which the literature has not given the attention it deserves, is dehydration. Mayo-Robson has reported the case of a greatly dehydrated patient. In certain of the cases here to be reported (Cases 1 and 8) dehydration was suggested by the clinical picture, and in several (Cases 4, 6, 7 and 8) it was actually present. Mild acidosis has also been mentioned by Sheinfeld and Mackler, and in Crane's case "there was quite evidently a concentration of sanguine." Max Thorek called attention to this symptom at the Congress of Gastroenterologists in Paris in 1937. The dehydration accompanying high obstructions of the gastrointestinal canal has been lucidly dealt with in a series of Scandinavian works (Fleischer Hansen; Hoegh Guldberg; Leander; Schnor). We are faced with a triad of symptoms consisting of loss of chlorides, alkalosis and azotemia; Schnor of Denmark has mentioned that especially the loss of chlorides may have especial diagnostic significance. To these symptoms must be added an increase in the cell volume, the hemoglobin, the erythrocytes, serum protein and fibrinogen and viscosity, while the sedimentation rate declines. In Blake's case, published by Friedmann, the patient is said to have had cramps in the legs and fingers. This suggested that dehydration (and particularly alkalosis) were rather intense. The diagnosis was established clinically as duodenal obstruction caused by gallstones.

The general health of the patient was greatly affected in many cases (Cases 1, 4, 5, 7, and 8) and strikingly unaffected in others (Cases 2 and 3). As a peculiar instance may be mentioned Crane's 80-year-old patient, who walked into the doctor's office after a motor ride of 60 miles.

Roentgen examination—with or without a contrast medium—has given great assistance in correct diagnosis; it has been successfully employed even for the newborn (Benson and Grover; Clausen; Ehrenpreis; Ladd). It has also made information available concerning the nature of the obstacle. In the case of megaduodenum it will give the diagnosis immediately. In a series of cases of gallstone perforations, reported rather uniformly in the literature, a roentgenogram of the duodenal bulb has shown a great defect surrounded by a thin border of contrast medium (B. Andersen; Brocq; Brodin and Aime; Crane; Sheinfeld and Mackler). The same applies to the case of the present series. Beck, in cases of arteriomesenteric compression, emphasizes the lateral roentgenogram as an aid in localizing the duodenal obstruction.

In a few instances of gallstone perforations it has been possible to map out the very cholecystoduodenal passage (Fiedler; Mintz; Mayo-Robson; Schüle), although it must be presumed that in a number of cases this process does not give any symptoms at all (Mondor; Mayo-Robson). This is not the rule, however, and cannot be (Mondor). When symptoms have been present they have taken the form of intensive stabbing pain, thus resembling, initially, a free perforation; fever and muscular rigidity set in, and resistance may be felt at the site of the gallbladder, but the symptoms of diffuse peritonitis will fail to develop. Hemorrhage will be evident as melena, or it may bleed into the stomach, with subsequent hematemesis. The stone itself may pass into the stomach and be vomited, as has been mentioned by Petit in his classic description of 1743; it may be aspired from the stomach (Grundzach) or it may pass per anum, as in the cases reported by Fiedler, Mintz and Schüle.

To Be Continued in June Issue

Acute Cholecystitis: Preoperative Treatment

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THE GOSPEL of the preoperative care of patients suffering from the symptoms of acute cholecystitis cannot be repeated too often. Upon this one point alone depends the separation of surgeons into two camps, namely, those who operate on these patients in the emergency and those who prefer to wait until the acute symptoms have subsided. All can be operated on at the opportune time provided the gastrointestinal tract is put at rest. To obtain physiological rest, it is important to starve the patient. No food or liquids may be administered by mouth. Instead, the patient is fed parenterally up to 3,000 cc. of fluid a day, consisting of 5 or 10 per cent dextrose, amigens and blood transfusions, and continuous gastric suction is used if necessary. Under this treatment no perforation of the gallbladder has ever been observed after the patient's admission to our surgical service. Antibiotics play an important role, especially in the prevention of infection by the Welch bacillus. Penicillin, aureomycin and sulfa products should be given routinely before and after operation.

Laboratory Tests.—While the patient is being prepared for operation, essential laboratory tests should be performed. No one should contemplate an operation of this kind without the knowledge of the levels of blood sugar, blood urea and prothrombin time. A sedimentation and a serum amylase test are of considerable help in selection of the opportune time for operation.

Morbidity and Mortality.—The object of all this preparation is to reduce the morbidity and the mortality. If the patient is to be operated upon precipitously, the safest procedure is a cholecystostomy. This operation can be avoided by following the rules for preparation outlined above. Again, a cholecystostomy makes it imperative later to perform a cholecystectomy. It has also been stated that more deaths occur after cholecystostomy than after cholecystectomy. A one-stage operation in any instance is preferable to a two-stage affair on account of the shortened residence in the hospital and avoidance of the psychological upset of having to undergo two operations. A cholecystectomy can always be performed if the symptoms are allowed to subside.

In 126 consecutive cholecystectomies, there were no deaths in 31 cases of acute cholecystitis. At a recent meeting of one of the branch county societies, a surgeon reported a 6.3 per cent mortality following cholecystectomy in 50 cases of acute cholecystitis soon after the patients were admitted to the hospital. It would now be interesting for the same surgeon to use as a control the preoperative care that I have been advocating for many years and note the difference in morbidity and mortality. It will be on the credit side of the ledger.

Pathologist Versus Surgeon.—Much has been written upon the subject of acute cholecystitis concerning the different opinions of the pathologist and the surgeon after the gallbladder has been removed. Often the pathologist returns a report of chronic cholecystitis when as a matter of fact, the physical signs before operation were those of an acute condition in the right upper quadrant of the abdomen. In evaluating the type of gallbladder, I depend more upon the physical signs and symptoms of the patient than upon the pathologic report. Even when the gallbladder is much thicker than normal, with gangrenous spots in it, a report of chronic cholecystitis has often been returned by the pathologist. Obviously, these gallbladders caused acute symptoms before they subsided and were put in a favorable condition for operation.

Perforation.—The fear that an acutely diseased gallbladder may perforate has been instilled into the younger surgeons and has led them to advocate the emergency operation. There is absolutely no danger of perforation when the patient is placed under the care of a surgeon in the hospital. This depends solely on the willingness of the surgeon to follow the outline of preoperative care as stated above. Many surgeons do not realize or understand

that the gastrointestinal tract must be put at rest physiologically, thereby inhibiting the secretions of the bile passageways. I have encountered only 3 or 4 cases of perforation in forty years of active surgery. In all of them the patients were brought in in the perforated stage owing to ill-advised treatment in the home.

It is true that I have seen chronic perforations of the gallbladder to the stomach, duodenum, jejunum and even the common duct. The best treatment for a perforation is the prophylactic removal of the gallbladder with stones when the symptoms are apparent. Perforations of the gallbladder are often reported by the pathologist when the specimen reaches the laboratory. Many of these are not observed by the surgeon at the time of operation. Therefore, I believe that many of these perforations are artifacts. They may be due to injury of the gallbladder at the time of operation and to handling of the specimens in the laboratory. In a panel on acute disease of the gallbladder held in Washington, D. C., under the auspices of the American College of Surgeons, the pathologist reported 20 per cent of perforations after the specimens reached the laboratory. This is preposterous and helps to create a spirit of unrest among surgeons when a patient with acute cholecystitis comes under their care. In other words, this would call for more emergency treatment, which to my mind causes more deaths than waiting for the gallbladder to subside.

SUMMARY AND CONCLUSIONS

1. An outline is presented of the preoperative care of acute manifestations of the gallbladder.

2. Physiologic rest by starvation treatment is advocated; parenteral feeding is depended upon to maintain the fluid balance.

3. Under this regimen, perforations do not occur.

4. The opportune time for surgical intervention can be better determined after a report of laboratory observations had been made.

5. Morbidity and mortality are reduced, as evidenced by the fact that 31 consecutive patients with acute involvement were operated upon without a death.

RÉSUMÉ ET CONCLUSION

1. On présente un sommaire des soins préopératoires et des symptômes aigus de la vésicule biliaire.

2. On conseille le repos physiologique par le jeûne. L'alimentation par d'autres moyens que la voie digestive maintient l'équilibre des liquides du corps.

3. Aucune perforation ne survient durant cette méthode de traitement .

4. Le choix du moment propre à l'intervention chirurgicale sera déterminé après avoir reçu le rapport des examens de laboratoire.

5. La mortalité et le danger opératoire diminuent comme le prouve le fait que 31 malades présentant des symptômes aigus furent opérés en suivant sans que se produise d'issue fatale.

RESUMEN Y CONCLUSIONES

1. Se presenta un esquema del cuidado preoperatorio de los trastornos agudos de la vesícula biliar.

2. El reposo fisiológico por el tratamiento basado en el ayuno es recommendable, dependiendo de la alimentación parenteral para mantener el equilibrio de los humores.

3. Bajo este régimen no se presentan perforaciones.

4. El momento oportuno para la intervención quirúrgica puede determinarse del mejor modo después de haber realizado un informe de las observaciones de laboratorio.

5. Se reducen la morbilidad y mortalidad, lo que lo demuestra el hecho de que 31 pacientes consecutivos con complicaciones agudas pudieran operarse sin una sola muerte.

RIASSUNTO

1. Descrive la cura preoperativa nelle affezioni acute della cistifellea.

2. Consiglia il oligiuno quale riposo fisiologico per l'organo malato. Il ricambio idrico puo' essere mantenuto per via parenterale.

3. In queste condizioni non si determina piu' la perforazione della cistifellea.

4. Il tempo piu' oppertuno per l'operazione puo' essere desunto dai dati di laboratorio.

5. Questa linea di condotta diminuisce notevolmente la morbilita' e la mortalita'. Sopra 31 consecutive operazioni per affezioni acute della cistifellea non e' occorso un solo caso letale.

Sympathicoadrenal Surgical Regulation of Glycemia

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CLAUDE BERNARD[1] established the fact that normoglycemia represents the balance between the grade of production of dextrose and its utilization by the tissues. The production of dextrose is hepatic and its utilization is mainly muscular.[2] The regulatory mechanism includes endocrine and neurohormonal factors. The fundamental principle of the regulation of dextrose is believed to be the result of biochemical tissue processes. According to Soskin and his co-workers,[3] the endocrine glands represent a closer state in the evolutionary scale of a more sensitive system. In animals there is a peculiar state of dextrose regulation that persists even after suppression of all possible emergency regulator mechanisms. This has been demonstrated after denervation of the liver,[4] the pancreas,[5] the adrenal medulla or the latter destroyed,[6] and also after total sympathectomy. It seems that the vagoinsular and sympathicoadrenal agents constitute an emergency mechanism, while there are other factors that act continuously, such as the anterior portion of the hypophysis, the thyroid, the adrenal cortex and the pancreas. The sympathicoadrenal system tends to raise the level of dextrose in the blood; so do the anterior portion of the hypophysis, the thyroid and the adrenal cortex, while the pancreatic vagoinsular system tends to lower it.

Our investigation was made to determine glycemic variations in normal persons by anatomic or functional section of the splanchnic nerve and the application of this procedure as a treatment for diabetes mellitus, taking into consideration that the adrenal medulla is a paraganglion depending through said splanchnic nerve from the superior autonomic nervous centers,[7] and showing rare endocrine relations,[8] the epinephrine thus liberated being hyperglycemic and glycosuric in character.[9]

Our experiments were based upon the function of the adrenal medulla of man in a condition of normal relaxation, as it appears to have been demonstrated that such function, in a condition of emergency, disappears through medulloadrenal suppression.

EXPERIMENTS ON ANIMALS

We wish to mention the effects of medulloadrenal suppression upon glycemia and sensitivity to insulin, after medullectomy and denervation, in normal and diabetic animals. The glycemic variations show the possible existence of epinephrine secretion during normal conditions; we say "possible," as it is well known that there are many different opinions on the subject. Sensitivity to insulin provides an idea as to epinephrine secretion under emergency conditions.[11] It rises in dogs[12] and cats[13] after unilateral medulloadrenalectomy and total contralateral adrenalectomy. However, this does not produce glycemic variations in dogs,[14] even though low glycemic values during fasting have been observed, which probably disappeared later.[15] Two or three weeks after medulloadrenalectomy the glycemic values tend to be lower than normal.[6b] Adrenal denervation increases sensitivity to insulin in dogs[16] without showing glycemic variations,[17] nor have variations been observed after splanchnicectomy with lumbar or abdominal simpathectomy.[18] In cats, splanchnicectomy also tends to raise sensitivity to insulin.[19] In pancreatectomized dogs with diabetes, adrenal denervation ameliorates their condition,[20] decreasing or suppressing the output of epinephrine.[21]

The interest of these experiments on animals lies in glycemic variations after adrenal denervation. There are the data essentially related to our observations in man. We have concluded from them that in animals, except in a few instances, the adrenal medulla does

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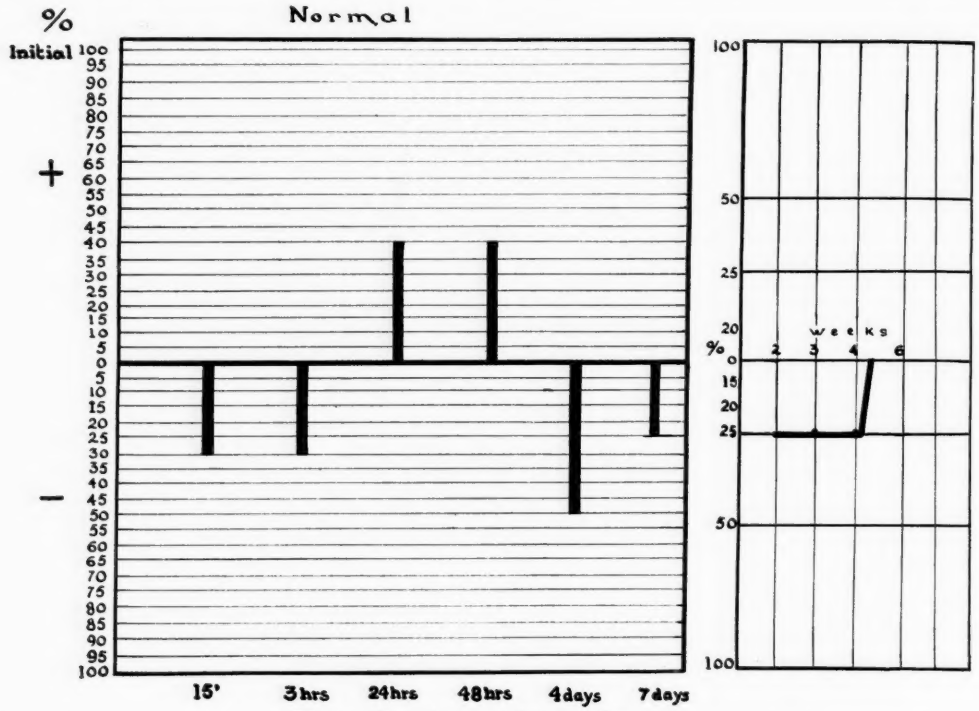

Fig. 1.—Glycemic curves for normal persons.

not seem to influence the glycemic levels during normal conditions.

OBSERVATIONS IN MAN

Corachan and Simarro[22] obtained favorable results in a case of diabetes mellitus after adrenal denervation.[23] Ciceri and Gabrielli performed functional section of the splanchnic nerve by alcoholization in 5 cases of diabetes mellitus, recording satisfactory results in three of them[24] and in further publications.[25] We must also mention the cases reported by Donati, Schmidt, Giordano, Crile, Manzanilla and others.[26] As regards man's sensitivity to insulin, it has been observed that after bilateral sympathectomy including the splanchnic nerve there have been no changes in any of the series of cases reported in the literature.[27]

We perform splanchnic functional section by alcoholization, following Alessandri and Valdoni. This acts not only upon the splanchnic nerves but upon the thoracic sympathetic system, depending on the state of diffusion shown by roentgenologic study,[28] as per tests confirmed by us in collaboration with Coqui. Adrenal denervation has been used as a surgical resource in certain cases, and supradiaphragmatic extraperitoneal splanchnicectomy is a common procedure.

Splanchnic functional section by alcoholization was performed on 50 normal adults and 60 diabetic adults with signs of active islet tissue, as per the clinical guide of Mosenthal.[29] Glycemic curves were plotted for both groups, showing averages in relation to percentages and considering as an indicator of the average for normal glycemia (Fig. 1) for diabetic hyperglycemia (Fig. 2).

RESULTS AND COMMENT

Without consideration of the transitory initial variations shown in Figure 1, we shall analyze the fundamental fact in both graphs, that

is, the more or less lasting hypoglycemia. Let us consider that the hypoglycemia is the result of cessation of a continuous secretion of epinephrine, in so far as the method employed by us acts only upon the splanchnic pathway.

Houssay, Lewis and Foglia have inferred that the pancreas regulates the glycemic level by preventing hyperglycemia and hypoglycemia. Normoglycemia maintains the usual internal secretion of the pancreas, while hyperglycemia increases it and hypoglycemia acts as a moderator. In the dog, transplantations of one to three pancreases brought about normoglycemia. This shows that the four pancreases secreted only as much insulin as one, moderating and adjusting their secretion in accordance with the glycemic level. Though large quantities of pancreatic tissue were added, it was not possible to diminish the glycemia.[30] These authors expressed the opinion that the moderating influence of the internal secretion of the pancreas depends on its extrinsic innervation, as the dogs into which pancreatic tissue was transplanted did not show any internal secretion.[31]

From our observations it may be thought that the hypoglycemic variations are partly compensated by the adjustor mechanism of the pancreas, which is demonstrated by the lesser intensity of hypoglycemia in normal persons than in diabetics. In the former, the moderating property of insulin secretion probably acts because of the intensity of the hypoglycemia, while in the latter the intensity and thus the stimulus are less. Owing to the intensity of the hypoglycemia observed, we think that the pancreatic glycemic regulator mechanism in man is limited as respects the regulation of insulin secretion.

THERAPEUTIC USES

Since Opi's descriptions, the association of pancreatic injury with diabetes has been considered common knowledge.[32] We are interested in correlating the known data concerning the effects of glycemic variations on pancreatic islet tissue, in so far as splanchnicectomy decreases glycemia. It appears that the glycemic index is the stimulus for secretion of insulin,[33] and if this stimulus is intensive, as it is in the presence of diabetes mellitus, the pancreatic islet tissue is injured, especially the beta cells.[34]

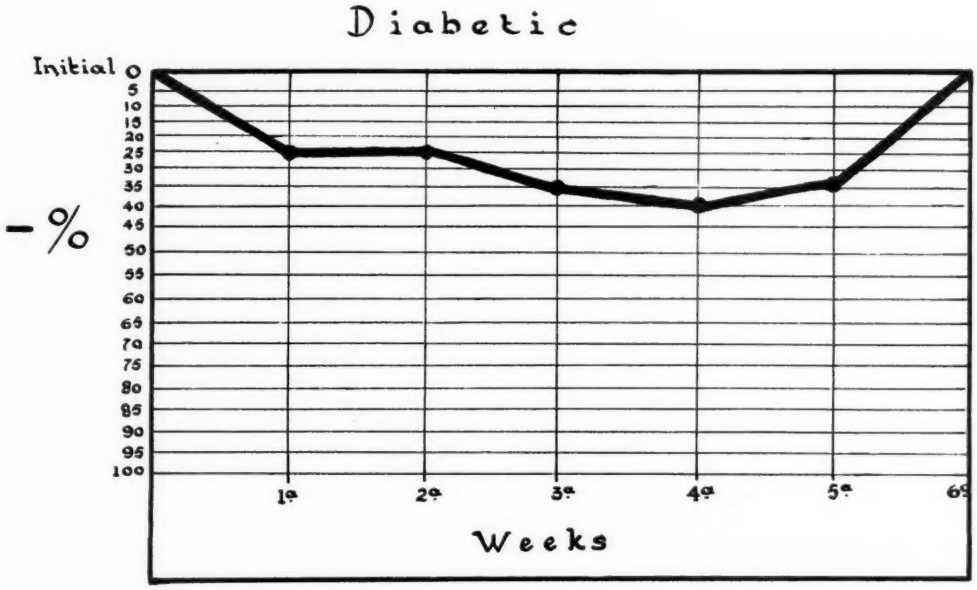

Fig. 2.—Glycemic curves for diabetic patients.

It is easy to understand, then, that if an intensive and uninterrupted stimulus produces anatomic degeneration and functional insufficiency of the beta cells, the glycemic drop caused by splanchnicectomy ameliorates the clinical picture of diabetes and diminishes the activity of islet tissue. In diabetic animals, children and obese patients, regeneration of tissue and functional pancreatic recuperation have been noted after lowering of the blood sugar level, which indicates the reversible nature of the lesions.[35] Therefore, splanchnicectomy as a therapeutic approach to diabetes would be indicated for those patients who still have functionally active pancreatic islet tissue, but not for those who require more than 30 to 40 units of insulin daily, since this indicates total damage.[36]

It is also indicated for certain types of neurogenic diabetes. Nevertheless, statistically these are not important; for them, the real value of splanchnic section lies in the prevention of islet tissue destruction and the probable stimulation of its regeneration in those cases in which there still is an active pancreas.

The use of this therapeutic measure will be intimately related to the evolutionary process of the disease and to the anatomic injuries and functional disturbances in the pancreas. From this we conclude that splanchnic section can be considered only on the basis of the fact that lowering of pancreatic islet tissue activity favors regeneration of the beta cells; the surgically produced drop in the blood sugar level is negligible because of its limited duration. Our opinion of its importance and utility in endocrinopancreatic regeneration is based upon experimental analogy.

SUMMARY

An investigation has been made of the hypoglycemic effects obtained after splanchnic section, either functional or anatomic, in 50 normal adults and in 60 diabetic patients.

The possible regeneration of pancreatic islet tissue is estimated by relative rest of the beta cells after the hypoglycemic effect.

The utility of this surgical measure in the treatment of pancreatic diabetes associated with remnants of active pancreatic islet tissue is discussed.

RÉSUMÉ

L'auteur a fait l'étude des effets hypoglycémiques obtenus après la section du splanchnique, effets soit fonctionnels soit anatomiques, chez 50 adultes normaux et 60 malades diabétiques.

La régénération possible du tissu des ilôts pancréatiques est évalué par le repos relatif des cellules bêtas après l'effet hypoglycémique.

L'utilité de cette intervention chirurgicale dans le traitement du diabète pancréatique associé à des ilôts pancréatiques actifs aberrants, est discutée.

RESUMEN

Se investiga el efecto hipoglicémico obtenido por sección esplácnica, funcional o anatómica, en 50 adultos normales y en 60 diabéticos.

Se estima la posible regeneración del tejido insular pancreático por el reposo relativo de las células- beta consecutivo al efecto hipoglicémico.

Se examina la utilidad del recurso quirúrgico en el tratamiento de la diabetes pancreática con tejido insular remanente activo.

RIASSUNTO

Ha indagato l'ipoglicemia successiva alla sezione o al blocco dello splancnico in 50 soggetti normali ed in 60 diabetici. Una possibile rigenerazione del tessuto insulare del pancreas viene giudicata in base al riposo relativo delle cellule beta dopo l'effetto ipoglicemico.

L'A. discute l'utilita' di questo metodo operativo nella cura del diabete pancreatico associato a residui di tessuto insulare attivo.

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Friendship

Friendship consists in forgetting what one gives and remembering what one receives.—*Dumas*

No man is useless while he has a friend.—*Stevenson*

Friendship is the only cement that will ever hold the world together.—*Wilson*

If a man's friends are not all the world to him, he does not deserve that the world should hear of him.—*Anon*

If a man does not make new acquaintance as he advances through life, he will soon find himself alone. A man, sir, should keep his friendship in constant repair.
—*Johnson*

Sympathectomy and Plastic Operation

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THE first task in the surgical reconstruction of an extensive traumatic tissue defect is to make the ulceration surface heal enough to take the skin transplanted on it. Every surgeon who has treated conditions of this kind knows, however, that such preparatory treatment takes a long time and that skin transplantation may sometimes be attended by unpleasant surprises even with the best technic and care, especially when the foot is concerned.

Feeling that, in the majority of cases, the reason for the failure of skin transplantation when carried out *lege artis* may be found in poor blood supply, I have since 1945 regularly aimed at the improvement of circulation in the foot by performing lumbar sympathectomy prior to the skin transplantation. The actual impulsion to this method was given by the following case, in which a skin transplantation to the foot was followed by an interesting complication:

T. K., a worker 23 years old, trod on a mine in June 1942, which caused a tissue defect on the medial aspect of the left foot. In July 1943 a direct pedicle skin flap was transplanted to the site of the defect. It was a success, though on the upper and lower edges of the flap thin scar lines remained. The skin flap, transferred in the beginning of 1945, was destroyed spontaneously and without having caused any symptoms, leaving the former open ulceration behind. Therefore, in March 1946, a lumbar sympathectomy wes performed. The desired effect soon appeared: The ulceration became clean and smaller. The last stage of the skin transplantation, with an abdominal tubed pedicle flap carried on the hand, was successfully performed in the following month.

Even though thin scar lines remained on the edges of the first skin flap, healing took place without any infection and the transplanted skin flap kept one and one-half years. And though, after that, infection may have contributed to the destruction of the flap, the main cause of it was without doubt insufficient blood supply to the surface of the ulceration. In its treatment, sympathectomy proved an excellent preliminary procedure before the skin transplantation was repeated.

Since then, in the Orthopaedic Hospital of the Invalid Foundation, sympathectomy has been used in 21 cases of tissue defect of the leg and foot. In 9 of these the improving effect of this procedure on the blood supply led to complete scarring of the ulceration, with the result that the patients did not wish to undergo any further skin transplantation. In 12 cases, however, sympathectomy was followed by a skin transfer. In 2 cases the tissue defect was situated on the leg and in 10 cases on the foot. A few of the foot ulcers could be repaired by local plastic procedures, but in 4 cases the

Fig. 1.—Result of skin transplantation in 1943. The transplanted skin remained as seen in the upper photograph for one and one-half years. Lower photograph shows same foot in 1945, the skin flap having undergone spontaneous destruction.

Fig. 2.—Extensive defect of sole before and after treatment.

direct skin pedicle flap method was used, and in 4 other cases an abdominal tubed pedicle flap was carried on the hand. The latter type of transfer has been used also in covering tissue defects of the leg.

As a rule sympathectomy has been performed immediately after treatment begins, in order to give the ulcer time to become clean and scarred either spontaneously or by means of free skin grafts, and to allow the scar tissue to be excised in due time and the skin pedicle flap transferred under as favorable circumstances as possible. If it has been found necessary to reserve an abdominal tubed pedicle flap for skin transplantation, sympathectomy has been performed through the same incision. Transplantation of the skin pedicle flap on a warm foot has always been aimed at. Therefore, even in cases in which the ulceration was already covered with scar when the patient began undergoing plastic treatment, sympathectomy has often been performed.

My experience shows that sympathectomy greatly promotes the reconstruction of extensive tissue defects of the leg and the foot. It has the following advantages: Ulceration becomes clean and scarred much more rapidly, either spontaneously or by means of free skin grafts; the transferred skin flap heals better, and the result of the skin transplantation is more durable.

The favorable effect of sympathectomy in vasomotor and trophic disturbances of the extremities was pointed out by Leriche as early as 1920. In the literature, however, I have found no reference to the successful application of this procedure to patients undergoing plastic surgical treatment. And the present short study, too, would probably never have been published had not Leriche, whom I told about my experiences, encouraged me to publish it.

RÉSUMÉ

Depuis 1945, l'auteur de cet article a préparé d'importantes pertes de tissus du pied et de la jambe à la greffe dermique par la sympathectomie lombaire. Cette méthode a les avantages suivants: l'ulcération se nettoie et se cicatrise plus rapidement, soit spontanément, soit par des greffes dermiques libres. Le lambeau de peau greffé se cicatrise mieux et le résultat de la greffe est plus durable.

RESUMEN

Desde 1945 el autor ha utilizado la simpatectomía lumbar para preparar la zona en donde existen extensas lesiones de los tejidos del pie y la pierna para practicar una transplantación o injerto cutáneo. El método tiene las siguientes ventajas: La ulceración existente es limpia y cicatriza con una rapidez mucho más considerable bien sea espontáneamente o mediante injertos cutáneos libres. El colgajo cutáneo transplantado se cura mejor, y el resultado de la transplantación cutánea es más duradero.

RIASSUNTO

Fin dal 1945 l'A. ha fatto precedere il trapianto della pelle sopra estesi difetti del piedi e della gamba da una simpatectomia lombare. La simpatectomia offrirebbe i seguenti vantaggi: ripulirebbe l'ulcerazione, mentre accelererebbe il processo cicatriziale spontaneo o successivo ai trapianti cutanei: il lembo cutaneo trapiantato guarirebbe meglio: i risultati a distanza del trapianto sarebbero piu' duraturi.

Recurring Giant Calculi of the Prostate
An Unusual Case

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PROSTATIC calculi may be single or multiple and may vary greatly in size. They are classified by Marion into two groups from the point of view of pathogenesis: exogenous calculi, which consist of renal or vesical stones that lodge in a cavity of the prostate and increase in size by the addition of phosphatic salts as a result of the infection they produce and/or maintain. The other group—the endogenous calculi—may form from urinary sediment in a pouch or abscess cavity in the prostate that communicates with the urethra; they may also develop in either a chronically infected prostate or a healthy one.

The following case is presented because it has three exceptional features: the great size of the stones, their extremely rapid recurrence in different forms and the youth of the patient.

REPORT OF CASE

A 21-year-old man was admitted to our service in January 1946 with partial retention of urine, chills and high fever of two weeks' duration. The patient had been aware of some heaviness in the perineum and rectum for several months. There was frequency of urination with increasing difficulty in passing urine.

The patient had had urinary bilharziasis in childhood. He was stuporous, with a temperature of 39 C., a dry tongue and a blood urea content of 52 mg. per hundred cubic centimeters. The vesical dullness extended to a point midway between the upper border of the pubis and the umbilicus. Rectal examination disclosed a stony hard mass the size of a grade III hypertrophy in the region of the prostate. Crackling could be elicited. A simple flat roentgenogram of the urinary system showed the presence of four chestnut-sized, highly calcified stones in the prostatic region, and a small pea-sized calculus in the lower part of the left ureter (Fig. 1).

Infusions and antibiotics were given. The general condition improved. On the third day after admission a suprapubic cystostomy was performed with peridural novocaine anesthesia. There were no stones in the bladder. The stones were found in a large pouch in the posterior urethra, from which they were dislodged with great difficulty. After their removal the prostatic cavity was felt to be contracting as after enucleation of a prostatic adenoma. The patient slowly recovered and two months later was discharged cured, a control roentgenograms having shown no stones in the prostatic region.

In September 1948, two and one-half years later, the patient was readmitted to the hospital, complaining of inability to pass urine except "by inserting a finger in the rectum." There was steadily increasing dysuria with perineal heaviness, and he had passed numerous small stones and much gravel in purulent urine for two months. Five days before admission he had had chills and a high fever. He had no complaints referable to defecation.

Physical examination showed him to be emaciated, anemic, toxic and in great distress. The tongue was dry. The temperature was 38.9 C. The suprapubic scar was tense and the bladder bulged conspicuously under it. It extended 10 cm. above the pubis and was exteremly tender, as was also the perineal region. Rectal examination was painful. The prostate was found to be a stone-hard, homogeneous mass the size of a small orange. The value for blood urea was 62 mg., and the urine contained 130 mg. of albumin per hundred cubic centimeters.

On admission a No. 10F silk-woven catheter was introduced with great difficulty. The urethra was felt to be "paved" with stones. Thick, purulent urine could be aspirated with great difficulty. The patient was given penicillin, sulfatherapy and infusions. His temperature came down. On the third day of hospitalization a suprapubic urinary fistula developed spontaneously through the scar of the previous operation. A suprapubic catheter was inserted to facilitate drainage.

A flat film of the urinary system showed the uniform shadow of a highly calcified stone in the prostatic region (Fig. 2). It was heart shaped, measuring 7 by 4 cm. A pea-sized stone in the

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Fig. 1—Plain roentgenogram showing prostatic stones (January 1946).

lower part of the left ureter had disappeared.

Six days later a perineal prostatotomy was performed with sacral and pentothal anesthesia, and a stone measuring 7 by 5 by 3 cm. was removed intact. The dissection was difficult on account of adhesions. The prostate was entirely replaced by the stone. A urethral catheter was inserted. The postoperative condition of the patient was good. On the third postoperative day the temperature was 36.8 C. and the perineum was dry. The urethral catheter was removed and a de Pezzer catheter introduced through the suprapubic fistula. Nine days after the operation the urethral catheter was reintroduced and fixed with continuous suction drainage, and a week later the area was dry, the suprapubic fistula having closed completely and the perineal wound having healed per primum. The patient was discharged three weeks after the operation. He could pass urine easily, in a good stream, 200 cc. at a time. The stone was composed of calcium and ammonium phosphates and urates (Fig. 3). The value per hundred cubic centimeters for serum calcium was 11.5 mg., for plasma phosphorus 2.7 mg., and for uric acid 5.5 mg.

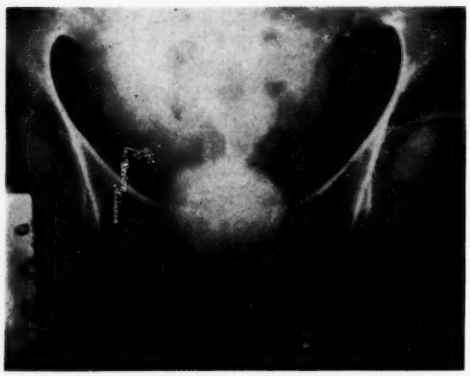

Fig. 2—Plain roentgenogram taken in September 1948, showing prostatic stone.

COMMENT

The main features of the case are the size of the stones and the fact that they recurred so rapidly. Three main factors in pathogenesis are to be noted: first, that the stones formed in a congenital pouch of the prostatic portion of the urethra. Second, this formation was aggravated by bilharziasis—in what way exactly it is difficult to say, perhaps by favoring urinary infection. In this connection it is interesting to note the not infrequent association of prostatic calculi with genitourinary tuberculosis, which, like bilharziasis, produces pathologic changes in the tissues such as tubercles, ulcers and calcifications. Third, there was a metabolic defect that could not be well defined. The patient's serum calcium level was slightly elevated, but his inorganic phosphorus level was normal and so was the uric acid content of the serum. The parathyroids were not enlarged, and the bones were normally calcified. The patient also had recurring stones in his left kidney. The fate of the stone in the lower part of the left ureter could not be traced because the patient—an uneducated peasant—did not turn up for a recheck as recommended. It is possible, however, that this stone became lodged in the prostatic cavity left after removal of the calculi in the first operation. This ureteral stone may have acted as a nucleus for the formation of the second prostatic stone. According to Winsbury-White, prostatic stones are associated with stones elsewhere in the urinary tract in one-third of all cases. This author has pointed out the importance of considering the close association of urinary lithiasis and prostatic disease in general. In the present case, however, the condition of the prostate could not be assessed, as it was reduced at the time of the operation to a mere shell 0.25 cm. in thickness.

The sexual power of the patient was unimpaired; he was surprised when asked whether he had normal intercourse and ejaculation. His wife had borne him a son, who was 2 years old on the father's second admission to the hospital. This retained sexual power can be compared with that following transurethral prostatectomy, and actually this is what his condition amounted to; after the suprapubic

Fig. 3—Prostatic stone removed by perineal prostatotomy in September 1948 (measured in inches).

removal of the stones in the first operation the prostatic bed was felt to be contracting, indicating that prostatic tissue was still present. At the second operation there was nothing but a thin fibrous tissue capsule.

As to the treatment, the suprapubic route was chosen the first time, because the stones were partly intravesical. In the second operation the perineal approach was thought best for several reasons: first, the stone was mainly extravesical; second, it was single, and it would have been difficult to remove it in one piece from above, especially as it was wider in its upper portion. Perineal operation was also favored because it permits better drainage. Moreover, the acute inflammatory condition of the suprapubic region contraindicated any approach from above. In the first operation small pieces may have been left behind—although the control roentgenogram revealed no abnormality—and formed the nucleus of the second stone.

The perineal operation also has the advantage of being less shocking, and the patient's general condition was particularly poor at the time of operation. The postoperative course was uneventful, and he made a much more rapid recovery than after the suprapubic cystostomy. The capsule was left behind and therefore this procedure was not as nearly ideal as Henline's subtotal prostatectomy, but the latter was impracticable on account of the presence of numerous adhesions.

A cavity being left behind, the chances that calculi will recur in this patient depend on how well the cavity is draining into the posterior urethra.

RÉSUMÉ

Un cas inusité de calculs géants récidivants de la prostate chez un homme de 21 ans est mentionné. Deux opérations furent exécutées, l'une par voie suspubienne et l'autre (pour récidive deux ans et demi aprés) par voie périnéale. Cette dernière parait préférable.

RESUMEN

Se presenta un caso de un cálculo gigante recurrente de la próstata en un paciente de 21 años. Se le practicaron dos intervenciones, una por vía subpúbica, y otra (para tratar una recaída acaecida dos años y medio más tarde) por vía peritoneal, considerándose que esta última vía es la preferida.

RIASSUNTO

Descrive un caso insolito di calcolo gigante, recidivante, della prostata in un uomo di 21 anni. Il calcolo e' stato asportato la prima volta mediante un operazione soprapubica: la seconda volta (2 anni ½ dopo) per via perineale. L'A. ritiene che questa sia preferibile.

Sección en Español

Una Nueva Filosofia de la Investigación Cientifica

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LAS ventanas iluminadas han desempeñado un papel trascendental en la historia de la Humanidad. El hombre gustó siempre de ornamentar templos y mansiones con ventanales de vidrios pintados de colores a través de los cuales el sol chispeaba andrajos de oro, púrpura y añil sobre el suelo de palacios y catedrales. A los últimos tiempos del arte preconstantiniano corresponden los famosos vidrios con dibujos en oro y el disco con tres retratos sobre fondo azul oscuro que decora la cruz de plata expuesta en el Museo de Brescia. El arte cristiano medioeval es un bordado de estampas de la Pasión sobre los vidrios de las grandes catedrales. Ayer y hoy, el creyente o el artista se deleitaron viendo al sol encender una verbena chispeante de rubíes y onzas doradas en las sedas y tisús de las princesas, y en las barbas floridas de los santos que pueblan las ventanas iluminadas. El ser humano agregó así a la piedra, el incienso y la plata de sus templos, una joyería de arco iris, aprisionando sus colores en los mantos y cabelleras de toda esa mística humanidad que esmalta las vidrieras de las catedrales.

En la casa de la Fundación Mayo, en Rochester, Minesota, Estados Unidos de Norteamérica, de noble abolengo y tradición hospitalaria para el visitante hispanoamericano, hay un ventanal iluminado. Se instaló en Marzo de 1943 en la ventana del Este del salón en el tercer piso usado para las reuniones de las sociedades médicas, quirúrgicas y de laboratorio e investigación. Un comité de altas personalidades científicas y arquitectos, dirigió la instalación de dicha vidriera iluminada. En ella está representada en doce paneles toda la historia de la Medicina—hombres, instituciones, acontecimientos—en su triple aspecto de práctica profesional, enseñanza médica e investigación científica. Esta última se presenta desde 500 a.d.J.C. a 1.500 a.d.J.C. en un panel donde un alquimista medioeval trabaja en su laboratorio extrayendo zumos medicinales de las plantas y buscando la piedra filosofal y la panacea universal, el triple objetivo de astrólogos y curanderos de la época. De 1500 a 1800, se simboliza la época de las teorías, sistemas y experimentos en la figura de Harvey, en vidrio azul, plata y bermellón, demonstrando al rey Carlos I de Inglaterra, el aparato circulatorio. Las sombras de Bacon, Hunter, Galvan y Volta le rodean y la frase de Claudio Bernard, "Cuelga tu imaginación con el sombrero en la percha al entrar en el laboratorio, para recogerla al marcharte" es timón de su obra. En otro panel—1800 a 1900—Pasteur rodeado de sus ayudantes y fieles animalitos domésticos lleva adelante la obra de reorganización de los métodos científicos de la que fueron pioneros Bernard, Koch y Beaumont. Desde 1900, la era de la Medicina preventiva, es el tema de otro panel. Dos estudiantes están usando el microscopio electrónico. La Física, Química, Biología y Roentgenología se unen en el campo de la Medicina preventiva. Algunos libros esparcidos en el laboratoria demuestran la continuidad del saber en el tiempo y el espacio.

El sol americano que ilumina a través de ese ventanal histórico los rostros de los médicos de las Américas allí reunidos para estudiar y hablar de Medicina, trae la luz de treinta siglos. Paralelamente al médico que cura y al maestro que enseña, viven en el vidrio iluminado, los investigadores que descubren. El próximo acto de curar se ha descompuesto, como la luz blanca a través de las facetas de un prisma, en tres ramas diferentes: Práctica, enseñanza e investigación. De esta última faceta deseamos hablar hoy, de la que Robert Patterson ha dicho que era "esa estentórea voz nueva de la ciencia y la tecnología" que resuena en todos los confines del mundo civilizado.

Hablar de investigación científica es ante

todo definir el objeto de nuestro estudio. Si lo desnudamos de toda la hojarasca adventicia para considerarlo en su tiritante desnudez conceptual, nos apercibimos de que la investigación científica, nuestra principal herramienta de exploración del universo, tiene como base el experimento reproducible, y que de una etapa de lógica e investigación pura, pasa a otra subsiguiente, de aplicación y metodología. No es un arte puro porque rechaza la soberanía de la intuición, ni es matemática porque antepone el experimento a la estadística. Tiene como última finalidad y objetivo el mismo de la civilización moderna: Prolongar la vida y mejorar la salud eliminando las causas de invalidez y muerte, para facilitar al ser humano su triunfo integral sobre el medio ambiente.

La Medicina como ciencia, es a la vez erudición—hechos, principios, teorías, métodos y reglas—y también acción. Es decir, teoría y práctica. Tiende a adquirir nuevos conocimientos y métodos mediante el estudio y observación; a transmitirlos, por la enseñanza; y a aplicar estos métodos a la creación de un arte de vivir con salud. Investigación, enseñanza y práctica médica son por tanto los tres peldaños de alabastro en la regia escalinata de la Medicina. El médico práctico, depositario del arte de curar, lo aplica como artista a mejorar la salud de los hombres y de los pueblos. El maestro médico tiene como objetivo legar su caudal de erudición al estudiante. El investigador se ocupa de animales y sustancias químicas en su laboratorio, de enfermos en clínicas y hospitales de estudio, y de poblaciones en las estadísticas de tipo social. Símbolo del médico práctico, devoto de la Medicina como arte—*ars medendi*—son Hipócrates y Sydenham; como Haller y Osler son encarnación del maestro que hace de la Medicina, disciplina pedagógica universitaria, y Harvey y Finlay personifican al investigador que hace de la Medicina, ciencia pura. Los tres batallan desde la misma trinchera contra los tres eternos enemigos de la Humanidad: Enfermedad—o sea dolor—vejez y muerte, cuya visión fué la voz que orientó la vocación mística de médico de almas de Gantama el Buda.

Con el desgranar inacabable de los días, la Medicina se ha ido transformando, apoyada por la investigación, en un arte de prevención y profilaxis. El papel desempañado por la investigación científica a este respecto, ha sido incalculable. En los comienzos, el mago y el hechicero no investigan las causas de la enfermedad, ya que hacerlo sería ofender a los demonios causantes. Cuando el sacerdote reemplaza al mago, todavía en los templos de Apolo y Esculapio, entre la blanca geometría de los mármoles, el arte de curar convertido en culto y ritual es finalidad exclusiva de la Medicina. En Grecia, el filósofo sustituye al sacerdote y con aquel se incia la investigación en la Medicina, y su paso de arte de curar, a ciencia aplicada. Luego, Demócrito introduce el átomo como urdimbre sutil de todo lo existente, Alcmeon reivindica el papel del cerebro como asiento de la inteligencia, Empédocles establece la doctrina humoral, Sócrates hace al hombre—no al universo—sujeto filosófico, Platón asienta los fundamentos de la Medicina psicosomática al indicar la unidad de cuerpo y alma, Aristóteles inicia la Biología científica e Hipócrates da a la Medicina una filosofía propia, completada por Galeno al usar el experimento como base de las doctrinas médicas.

La Edad Media, no representa un retroceso en todo el saber médico. Cierto es que las estrellas de la Astronomía se convierten en luceros de simbolismo astrológico y que las probetas del químico se trocan en los febriles crisoles del alquimista en busca de la piedra filosofal. Mas las catedrales se hacen templos del estudio donde se traducen y escancian en moldes occidentales las esencias del saber clásico, y los árabes adelantan en la farmacología. Después, la llamarada renacentista: Copérnico, Vesalio y Descartes resucitan el espíritu platónico de la investigación, Gilbert enuncia el magnetismo y Harvey la circulación de la sangre. En los siglos ulteriores, pasado el furor iatroquímico e iatrofísico de Willis y Pitcairne—Sydenham y Boerhaave reivindican el aspecto humano de la Medicina, John Hunter, el titán escocés, demuestra el valor de la Anatomía patológica en la investigación médica. A él se debe la frase famosa en una carta a su amigo Edward Jenner, el descubridor de la vacuna: ¿Por qué pensar? ¿Por qué no probar el experimento? Hunter anticipa el pensamiento científico moderno al unir la Medicina y la Biología sobre su mesa de disección anatómica.

En el siglo pasado, la verdadera naturaleza de la investigación científica, se alumbra completamente al descorrerse un cortinaje y entrar en el escenario Claudio Bernard. El padre de la Fisiología moderna, estableció las estapas de toda investigación científica: observación, hipótesis y comprobación experimental. Su filosofía, expresada en su "Introducción al estudio de la Medicina experimental" es un estudio clásico que desde 1865 ha orientado el pensar del investigador moderno.

Nuestro siglo representa un trampolin desde el que la investigación médica se ha zambullido de lleno en un océano estrictamente científico. La excesiva especialización existente en el orden del arte médico está compensada por una tendencia a la síntesis en el campo de la investigación. Las especialidades están reagrupándose bajo nuevas banderas, tan nuevas que como en el caso de la unión de la Neuropsiquiatría, solo son nuevas porque de tan desteñidas por el sol de los siglos no pueden verse los viejos colores. Hay un grito de integración y universalismo flotando en los aires de los laboratorios. El cerebro del investigador está comenzando a ser un pequeño firmamento con un sol central de interés en un tema, pero con muchos astros en su derredor de intereses científicos diversos. El investigador—pasada la fase de su pensamiento ochocentista puramente microquímico y analítico—ha vuelto a ser un filósofo. Mas su filosofía es la de investigar con un pensamiento amplio y libre y un propósito de aplicación de sus descubrimientos al arte de curar. Fleming—investigador puro—dió a Florey con la penicilina, la herramienta mágica con que labrar una página inmortal en el arte médico. El investigador médico que estudia anatomía patológica sabe que como Osler recomendó, el hospital y la Facultad de Medicina se centran en torno al humilde mármol de su mesa de autopsias. Cada investigador no puede ya ignorar lo que está pasando en otros campos de la ciencia moderna. Un bello espíritu de colaboración une a los investigadores en cualquier domino de la Medicina. De la fusión del trabajo de físicos, bacteriólogos y electrotécnicos, ha surgido el portentoso microscopio electrónico. La obra conjunta de bacteriólogos, bioquímicos y clínicos, ha descubierto las nuevas sulfamidas. Micólogos y veterinarios, químicos y farmacólogos están arrancando a la esfinge de la Naturaleza, el secreto de sus antibióticos. El saber acumulado de entomólogos, parasitólogos y biólogos está dando los nuevos antipalúdicos. A la penicilina, los bancos de sangre, el ácido fólico, las globulinas sanguíneas, las nuevas técnicas de neurocirugía, el suero antirretículoendotelial, la nueva física electrónica de laboratorio, se unen otros descubrimientos sensacionales. Se tratan las úlceras gástricas mediante aminoácidos hidrolizados; la fiebre moteada de las montañas Rocosas por el ácido paraaminobenzoico, se descubre el mecanismo por el que la insulina libera hexoquinasa de la hipófisis anterior, se ensaya la estreptomicina en la tuberculosis, se trata satisfactoriamente el cólera por el plasma hemático y las tripanosomiasis por el ácido gama butírico, se usa la gelatina blancuzca que impurifica las tuberías en las fábricas de azúcar en vez de plasma en casos de shock y se transplantan corazones en animales de sangre caliente, se descubren nuevos antibióticos como la terramicina y la neomicina, y se incorpora la vitamina B_{12} al arsenal vitamínico, y ea histamina y los esteroides al psiquiátrico.

La investigación científica ha llegado así en el año crucial de 1946 a un espléndido desarrollo. El investigador ha escrito con su labor su propia filosofía. En su microscopio y su tubo de ensayo, en su espectrofotómetro y su hematocrito, en su laboratorio y su clínica, treinta siglos de evolución histórico-médica estrechan la mano a veinte ciencias aliadas, desde la Física a la Agricultura. La Medicina del porvenir, será cada vez más una ciencia en sus métodos—la investigación pura y aplicada—pero también un arte en su finalidad moral de servir a los hombres. El médico es cada día más, un investigador, aunque sea en su simple consultorio o entre sus libros en la universidad. Para algunos investigadores seguirá la Fama haciendo "sonar sus largas trompetas," pero nuestra admiración está dedicada sobre todo a los que trabajan y desaparecen "sin cantar, pero con música en el corazón." Con unos y otros—los capitanes generales de la Medicina y los soldados rasos de la cruzada blanca—el mundo marcha por la ciencia y la conciencia, hacia la salud y la felicidad.